Wm: Spencers

THE

GOLDEN CABINET:

BEING THE

LABORATORY,

OR

HANDMAID to the ARTS.

CONTAINING

Such *Branches* of *Uſeful Knowledge*,
As nearly concerns all Kinds of People,
From the PEER to the PEASANT:
And will afford both
PROFIT and DELIGHT.

The SECOND EDITION, with conſiderable Additions and Improvements.

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THE

SCHOOL of ARTS.

Of gilding, ſilvering, bronzing, japanning, laquering, and the ſtaining different kinds of ſubſtances, with all the variety of colours.

PART I.

Of gilding in general.

THE gilding different ſubſtances is performed by a variety of means accommodated to the nature of each. But the principle is the ſame in all; (except with reſpect to one kind practiſed on metals, where quickſilver and heat is uſed, which I omit here as not properly a part of the ſubject of this work;) being only the putting ſome proper cement on the body to be gilt; and then laying the gold either in the form of leaves, or powder, on the cement; which binds it to the body. The principal kinds of gilding are thoſe called *oil gilding*;

—*burniſh gilding*;—and *japanners gilding*, or *gilding with gold ſize*. Theſe may be promiſcuouſly uſed on grounds either of wood, metal, or any other firm and rigid body: but paper and leather require a treatment in ſome caſes peculiar to themſelves. The firſt attention, in moſt kinds of gilding, is the choice of leaf gold: which ſhould be pure, and of the colour accommodated to the purpoſe, or taſte, of the work. Purity is requiſite in all caſes: for if the gold be allayed with ſilver, it will be of too pale and greeniſh a hue for any application; and if it contain much copper, it will in time turn to a yet much ſtronger green. The purity may be aſcertained with accuracy enough for this purpoſe, by the touchſtone, and *aquafortis*; and the fitneſs of the colour, to any particular purpoſe, may be diſtinguiſhed by the eye. The full yellow is certainly the moſt beautiful and trueſt colour of gold: but the deep reddiſh caſt has been of late moſt eſteemed, from the caprice of faſhion. Whichever may be choſen, the colour ought nevertheleſs to be good of the kind; for there is a great variation in the force and effect of different parcels of the ſame teint; ſome appearing more foul and muddy; others bright and clear. The beſt method however of judging of the colour of leaf gold with nicety, is by keeping a ſpecimen of ſuch as is perfect; with which any freſh parcel may be occaſionally compared. There is, beſides the true leaf gold, another kind in uſe, called Dutch gold: which is copper gilt, and beaten into leaves like the genuine. It is much cheaper; and has, when good, greatly the effect of the true, at the time of its being laid on the ground; but, with any acceſs of moiſture, it loſes its colour, and turns green in ſpots; and, indeed, in all caſes, its beauty is ſoon impaired, unleſs well ſecured by laquer or varniſh. It is nevertheleſs ſerviceable for coarſer gilding, where large maſſes are wanted; eſpecially where it is to be ſeen by artificial light, as in the caſe of theatres: and if well varniſhed, will there in a great meaſure anſwer the end of the genuine kinds. The other

preparations

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preparations of gold, belonging to particular kinds of gilding, I ſhall treat of them, as likewiſe the cements or other ſubſtances employed, in their reſpective places; and proceed now to ſhew, what the inſtruments are, which are common to the three principal methods.

Of the inſtruments that are common to the oil, burniſh, and japanners gilding.] The firſt neceſſary inſtrument is, a cuſhion for receiving the leaves of gold from the paper, in order to its being cut into proper ſize and figures, for covering the places to be gilt. This cuſhion ſhould be made of leather, and faſtened to a ſquare board, which ſhould have a handle. It may be of any ſize, from fourteen inches ſquare to ten; and ſhould be ſtuffed betwixt the leather and board with fine tow or wool; but in ſuch a manner, that the ſurface may be perfectly flat and even. A proper knife is the next, and an equally requiſite inſtrument; as it is neceſſary in all caſes to cut, or divide the gold into parts correſpondent to thoſe, which are to be covered. This knife may be the ſame in all reſpects as thoſe uſed in painting, called *pallet knives*; the blade of which may be four or ſix inches long, and ſomewhat more than half an inch in breadth, with a handle proportionable. A ſquirrel's tail is likewiſe generally provided, for taking up the whole leaves, and for compreſſing the gold to the ſurface where it is laid, and giving it the poſition required. It is uſed alſo by ſome for taking up the parts of leaves; but this is better done by means of a ball of cotton wool; which will both anſwer this end, and that of compreſſing the gold in a more eaſy and effectual manner. This ſquirrel's tail is cut ſhort, and ſometimes ſpread in the fan-faſhion by means of a piece of wood formed like a pencil ſtick, but broad at one end, and ſplit to receive the tail; but it will equally ſerve the purpoſe in its own form, when the hair is cut to a proper length. This inſtrument is by ſome called a *pallet*; but improperly; as the board for holding the colours in painting, and which is frequently in uſe along with this, being called by the ſame name, would neceſſarily produce a confuſion in ſpeaking of either. A bruſh of very ſoft hog's hair, or of the fitch kind, made large, is likewiſe commonly uſed for paſſing over the work when it is become dry, in order to take off the looſe gold. Some fine cotton wool is alſo neceſſary for taking up the ſmaller parts of the leaves, and laying them on the work: as alſo for compreſſing and adjuſting them when laid on. The cotton ſhould be formed into a ball, by tying it up in a piece of fine linen rag; for if it be uſed without the rag, the fibres adhere to the gold ſize, and embarraſs the work. A ſmall ſtone and mullar, with a proportionable pallet knife, are required for grinding and tempering the mixtures made of the fat oil, or gold ſize, with each other, and the colours that may be added to them. Proper bruſhes are alſo wanted for laying on, and ſpreading the fat oil, or ſize, on the work: and ſome of theſe ſhould be fitches of different ſizes; in order to convey, and ſettle the gold, where the relief of carved work forms deep hollows. Theſe are all the inſtruments that are common to all the three principal kinds of gilding; ſuch as are peculiar to each, I ſhall take notice of where they more properly occur.

The manner of oil gilding, and the preparation of fat oil.] The gilding with oil is the moſt eaſy and cheap, as well as moſt durable kind; and, therefore, is moſtly applied to common purpoſes. It is performed by cementing the gold to the ground, by means of fat oil. The preparation of which is, therefore, previouſly neceſſary to be known; and may be much better managed in the following manner, than by any method hitherto taught, or commonly practiſed.—" Take any quantity of linſeed " oil; and put it into an earthen, or any other veſ- " ſel of a broad form, ſo that the oil may lie in it " with a very large ſurface; but the proportion " ſhould be ſo limited, that the oil may be about an " inch thick in the veſſel. The earthen pans uſed " for milk in the forming cream for butter are very " well accommodated to this purpoſe. Along with “the oil as much water ſhould be alſo put into the veſſel, as will riſe ſix inches or more above the bottom. Place the veſſel then, with the oil ſwimming on the water, in any open place where the ſun and rain may have acceſs to it; but where it may be as free from receiving duſt and filth as poſſible. Let it ſtand in this condition, ſtirring the contents on every opportunity, for five or ſix weeks, or till it appear of the conſiſtence of treacle. Take the oil then from off the water into a phial, or bottle of a long form, or, what is better, into a ſeparating funnel, ſuch as is uſed by the chemiſts, and there draw off the remainder of the water. Place it afterwards, being in the long bottle or phial, in ſuch heat as will render it perfectly fluid; and the foulneſſes it may contain will ſoon ſubſide to the bottom; when the clear part muſt be poured off; and the remainder ſtrained through a flannel, while yet water, and the whole will then be fit for uſe.”——It is to be obſerved, that this method is only practicable in ſummer; as the ſun has not ſufficient power in winter to produce a due change in the oil. This method differs from that commonly practiſed, in the addition of the water; which ſuffers the foulneſs to ſeparate from the oil, and ſink to the bottom, where it remains without being again mixed with the oil every time it is ſtirred, as is unavoidable where no water is uſed. The water likewiſe greatly contributes to bleach the oil, and improve it in other reſpects. The beſt previous preparation of the piece to be gilded, if it have not already any coat of oil paint, is to prime it with drying oil wixed with a little yellow oker; to which, alſo, a very ſmall proportion of vermillion may be added. But where greater nicety and perfection is required in the work, the wood ſhould be firſt rubbed with fiſh ſkin; and then with Dutch ruſhes. This priming being dry, the next part of the operation is the ſizing the work; which may be done, either with the fat oil alone; (but diluted with drying oil, if too thick to be worked without) or with ſat oil and the japanner's gold ſize, (of which the preparation is below taught,) either in equal quantities, or in any leſs proportion, with reſpect to the gold ſize. The difference betwixt the uſe and omiſſion of the gold ſize, in this way of gilding, lies in two particulars. The one is, that the ſizing dries faſter according to the proportion of the quantity of the gold ſize to the fat oil, and is conſequently ſo much the ſooner fit to be gilded. The other is, that the gilding is alſo rendered, in the ſame proportion, leſs ſhining and gloſſy; which is eſteemed a perfection in this kind of gilding: though, taking away the prejudice of faſhion, I ſhould think the moſt ſhining the moſt beautiful; and of the ſtrongeſt effect. The fat oil, or the compound of that and the gold ſize, muſt be ground with ſome yellow oker; and then, by means of a bruſh, laid thinly over the work to be gilt. But, in doing this, care muſt be taken to paſs the bruſh into all the hollows and cavities, if the ſubject be carved, or have any other way, projecting parts. For where the ſize fails to be laid on, the gold will never take till the work be again repaired by going over the defective places with freſh ſize; which ſhould be avoided as much as poſſible. Where great perfection is required, the gold ſhould not be laid on the firſt ſizing; but that being ſuffered to dry, the work ſhould be again ſized a ſecond time: and ſome who are very nice even proceed to a third. The work being thus ſized, muſt be kept till it appear in a proper condition to receive the gold: which muſt be diſtinguiſhed by touching with the finger. If it appear then a little adheſive or clammy, but not ſo as to be brought off by the finger, it is in a fit condition to be gilt. But if it be ſo clammy as to daub or come off on being touched, it is not ſufficiently dry, and muſt be kept longer: or if there be no clammineſs or ſticky quality remaining, it is too dry, and muſt be ſized over again before it can be gilt. When the work is thus ready to receive the gold, the leaves of gold, where the ſurface is ſufficiently large and plain to contain them, may be laid on intire, either by means of the ſquirrel's tail; or immediately from the paper in which they were originally put; a method, that, by thoſe who have the proper dexterity of doing it, is found to be much the ſimpleſt and quickeſt, as well as beſt, for the perfection of the work. Being laid on the proper parts of the work, the leaves muſt then be ſettled to the ground, by compreſſing thoſe, which appear to want it, gently with the ſquirrel's tail or cotton ball; and if any part of the gold has flown off, or been diſplaced, ſo as to leave a naked or uncovered ſpot, a piece of another leaf, of ſize and figure correſpond to ſuch ſpot, muſt be laid upon it. Where the parts are too ſmall to admit of the laying on whole leaves, or where vacancies are left after laying on whole leaves which are leſs than require others to cover them, the leaves which are to be uſed muſt be firſt turned from the paper upon the cuſhion (deſcribed above amongſt the inſtruments.) They muſt then be cut, by ſcoring over them, with the knife, (above deſcribed likewiſe,) into ſuch diviſions or ſlips as may be moſt commodiouſly laid on the parts of the work to be covered. After which being ſeparated, and taken up as they are wanted by means of the cotton wool, to which being breathed upon they will adhere, they muſt be laid in the places they are deſignto cover; and gently preſſed by the cotton, till they touch every where, and lie even on the ground. Where the work is very hollow, and ſmall pieces are wanted to cover parts that lie deep and out of the reach of the ſquirrel's tail or the cotton, they may be taken up by the point of a fitch pencil (being firſt breathed upon) and by that means conveyed to and ſettled in their proper place. Thoſe who are accuſtomed to it uſe the pencil commodiouſly for a great part of the work where large parts of the leaves cannot be uſed. The whole of the work being thus covered, ſhould be ſuffered to remain till it be dry; and it may then be bruſhed over by a camel's hair pencil or ſoft hog's hair bruſh, to take off from it all looſe parts of the gold. If, after the bruſhing, any defective parts, or vacancies appear in the gilding, ſuch parts muſt be again ſized; and treated in the ſame manner as the whole was before: but the japanner's gold ſize alone is much better for this purpoſe than either the fat oil alone, or any mixture.

Of burniſh gilding; with the preparation of the proper ſizes, &c.] The gilding with burniſht gold is ſeldom practiſed, but upon wood; and at preſent moſtly in the caſe of carved work, or where carved work is mixed with plain. The chief difference in the manner betwixt this and old gilding lies in the preparing the work to receive the gold; and in the ſubſtituting a ſize made of parchment, or the cuttings of glover's leather in the place of the fat oil, as a cement. The preparation of this ſize ſhould, therefore, be previouſly known; and may be as follows.—" Take a pound of the cuttings of parch-" ment, or of the leather uſed by glovers; and, " having added to them ſix quarts of water, boil " them till the quantity of fluid be reduced to two " quarts: or till, on the taking out a little, it will " appear like a jelly on growing cold. Strain it " through flannel while hot; and it will be then fit " for uſe."—This ſize is employed in burniſh gilding, not only in forming the gold ſize, or cement for binding the gold to the ground; but alſo in priming, or previouſly preparing the work. But before I proceed to ſhew the manner of uſing it ſo, it is neceſſary to give the compoſitions for the proper cement or gilding ſize employed in this kind of gilding. There are a multiplicity of recipes for this compoſition, which are approved of by different perſons: but as in general they vary not eſſentially from each other, I will only give two, which I believe to be each the beſt in their kinds.——" Take " any quantity of bole ammoniac, and add ſome " water to it, that it may ſoak till it grow ſoft. " Levigate it then on the ſtone, but not with more " water than will prevent its being of a ſtiff conſiſt-" ence; and add to it a little purified ſuet or tallow " ſcraped; and grind them together. When this is "wanted for uſe, dilute it to the conſiſtence of "cream, by parchment or glovers ſize, mixt with "double its quantity of water, and made warm. "Some melt the ſuet or tallow, and mix it previ- "ouſly with five or ſix times its weight of chalk "before it is put to the bole, to facilitate their com- "mixture; to which in this wet ſtate they are other- "wiſe ſomewhat repugnant. It is alſo ſometimes "practiſed to put ſope-ſuds to the bole; which will "contribute to its uniting with the tallow."—This is the ſimpleſt compoſition, and equally good with the following, or any other; but for the indulgence of the variety of opinions, which reigns in all theſe kinds of matters, I will inſert another.—"Take of "bole in fine powder one pound, and of black lead "two ounces. Mix them well by grinding; and "then add of olive oil two ounces, and of bees- "wax one ounce, melted together; and repeat the "grinding till the whole be thoroughly incorpora- "ted. When this mixture is to be uſed, dilute it "with the parchment or glovers ſize, as was direct- "ed in the former recipe. But till the time of uſing "them, both this and the foregoing ſhould be kept "immerſed in water, which will preſerve them "good."—To prepare the wood for burniſh gilding, it ſhould firſt be well rubbed with fiſh-ſkin; and then with Dutch ruſhes: but this can only be practiſed in the larger and plainer parts of the work, otherwiſe it may damage the carving, or render it leſs ſharp by wearing off the points. It muſt then be primed with the glovers ſize, mixed with as much whiting as will give it a tolerable body of colour: which mixture muſt be made by melting the ſize, and ſtrewing the whiting in a powdered ſtate gradually into it, ſtirring them well together, that they may be thoroughly incorporated. Of this priming ſeven or eight coats ſhould be given, time being allowed for the drying of each before the other be put on; and care ſhould be taken, in doing this, to work the priming well, with the bruſh, into all the cavities or hollows there may be in the carved work.

After the laſt coat is laid on, and before it be quite dry, a bruſh pencil dipt in water ſhould be paſſed over the whole, to ſmooth it and take away any lumps or inequalities that may have been formed: and when it is dry, the parts which admit of it ſhould be again bruſhed over till they be perfectly even. The work ſhould then be repaired, by freeing all the cavities and hollow parts from the priming, which may choak them, or injure the relief of the carving: after which a water poliſh ſhould be given to the parts deſigned to be burniſhed, by rubbing them gently with a fine linen rag woiſtened with water. The work being thus prepared, when it is to be gilt, dilute the compoſition of bole, &c. with warm ſize mixt mith two-thirds of water; and with a bruſh ſpread it over the whole of the work, and then ſuffer it to dry; and go over it again with the mixture, in the ſame manner, at leaſt once more. After the laſt coat, rub it in the parts to be burniſhed, with a ſoft cloth, till it be perfectly even. Some add a little vermilion to the gilding ſize, and others colour the work, if carved, before it be laid on, with yellow and the glovers ſize; to which a little vermilion, or red lead, ſhould be added. This laſt method is to give the appearance of gilding to the deeper and obſcure parts of the carving, where the gold cannot, or is not thought neceſſary, to be laid on. But this practice is at preſent much diſuſed; and inſtead of it ſuch parts of the work are coloured after the gilding; which treatment is called *matting*. The work being thus properly prepared, ſet it in a poſition almoſt perpendicular, but declining a little from you: and having the gilding ſize, place all the neceſſary inſtruments above deſcribed ready, as alſo a baſon of clean water ready at hand: wet then the uppermoſt part of the work, by means of a large camel's hair pencil dipped in the water; and then lay on the gold upon the part ſo wet, in the manner above directed for the gilding in oil, till it be completely covered, or become too dry to take the gold. Proceed afterwards to wet the next part of the work, or the ſame overagain if neceſſary, and gild it as the firſt; repeating the ſame method till the whole be finiſhed. Some wet the work with brandy, or ſpirit of wine, inſtead of water; but I do not conceive any advantage can ariſe from it, that may not be equally obtained by a judicious uſe of water. This manner is moreover much more troubleſome and difficult, as well as expenſive. For only a ſmall part muſt be wet at one time, and the gold laid inſtantly upon it, or the brandy or ſpirits will fly off, and leave the ground too dry to take the gold. The work being thus gone over with the gilding, muſt be then examined; and ſuch parts as require it repaired, by wetting them with the camel's hair pencil, and covering them with the gold; but as little as poſſible of the perfect part of the gilding ſhould be wet, as the gold is very apt to turn black in this ſtate. When the repaired part alſo is dry, the work may be matted, if it require it; that is, the hollow parts muſt be covered with a colour the neareſt in appearance to gold. For this purpoſe ſome recommend red lead, with a little vermilion ground up with the white of an egg: but I think yellow oker, or Dutch pink, with red lead, would better anſwer the end: or the *terra di Sienna* very ſlightly burnt or mixed with a little red lead would have a much better effect; and be more durable than any other mixture ſo near the colour of gold in ſhade. Iſinglaſs ſize will likewiſe equally well ſupply the place of the whites of eggs in the compoſition for matting. The work being thus gilt, it muſt remain about twenty-four hours; and then the parts of it that are deſigned to be burniſhed, muſt be poliſhed with the dog's tooth, or with the burniſhers of agate or flint made for this purpoſe. But it ſhould be previouſly tried, whether it be of the proper temper as to the dryneſs. For though twenty-four hours be the moſt general ſpace of time, in which it becomes fit, yet the difference of ſeaſon, or the degree of wet given to the work, makes the drying irregular, with regard to any fixt period. The way of diſtinguiſhing the fitneſs of the work to take the burniſh, is to try two or three particular parts at a diſtance from each other; which, if they take the poliſh in a kindly manner, the whole may be concluded fit. But if the gold peel off, or be diſordered by the rubbing, the work muſt be deemed not yet dry enough: and if the gold abide well the rubbing, and yet receives the poliſh ſlowly, it is a proof of its being too dry: which ſhould be always prevented, by watching the proper time. For the work, when too dry, both requires much more labour to burniſh it, and fails at laſt of taking ſo fine a poliſh.

Of japanners gilding.] The japanners gilding is performed by means of gold powder, or imitations of it, cemented to the ground by a kind of gold ſize much of the nature of drying oil: for the making which, there are various recipes followed by different perſons. I ſhall, however, only give one of the more compound, that is much approved; and another very ſimple, but which, nevertheleſs, is equally good for the purpoſe with the moſt elaborate. The more compound gold ſize may be thus made.——"Take of gum animi and aſphaltum each one "ounce, of red lead, litharge of gold, and umbre, "each one ounce and a half. Reduce the groſſer "ingredients to a fine powder; and having mixed "them, put them, together with a pound of linſeed "oil, into a proper veſſel, and boil them gently; "conſtantly ſtirring them, with a ſtick or tobacco-"pipe, till the whole appear to be incorporated. "Continue the boiling, frequently ſtirring them, "till, on taking out a ſmall quantity, it appear "thick like tar, as it grows cold. Strain the mix-"ture then through flannel; and keep it carefully "ſtopt up in a bottle, having a wide mouth, for uſe. "But when it is wanted, it muſt be ground with as "much vermilion, as will give it an opake body; "and at the ſame time diluted with oil of turpen-"tine, ſo as to render it of a conſiſtence proper for "working freely with the pencil."—The aſphaltum does not, I conceive, contribute to the intention of gold ſize: and the litharge of gold, and red lead, are both the ſame thing, with reſpect to this purpoſe, under different names: and neither they nor the umbre neceſſary, but clogging ingredients to the compoſition. This gold ſize may therefore be equally well, or perhaps better prepared, in the following manner.—" Take of linſeed oil one pound, and of " gum animi four ounces. Set the oil to boil in a " proper veſſel; and then add the gum animi gra" dually in powder; ſtirring each quantity about in " the oil, till it appear to be diſſolved; and then " putting in another, till the whole be commixt " with the oil. Let the mixture continue to boil, " till, on taking a ſmall quantity out, it appear of " a thicker conſiſtence than tar: and then ſtrain the " whole through a coarſe cloth, and keep it for uſe. " But it muſt, when applied, be mixed with vermi" lion and oil of turpentine, in the manner directed " for the foregoing."—This gold ſize may be uſed on metals, wood, or any other ground whatever. But before I enter on the particular manner of gilding with it, the preparation of the true, and counterfeit, gold powders are neceſſary to be ſhewn. The true gold powder may be well and eaſily made by the following method.—" Take any quantity of leaf gold; " and grind it with virgin honey, on a ſtone, till the " texture of the leaves be perfectly broken; and " their parts divided to the minuteſt degree. Then " take the mixture of gold and honey from off the " ſtone; and put it into a China or other ſuch ba" ſon, with water; and ſtir it well about, that the " honey may be melted; and the gold by that means " freed from it. Let the baſon afterwards ſtand at " reſt, till the gold be ſubſided; and when it is ſo, " pour off the water from it; and add freſh quanti" ties till the honey be intirely waſhed away; after " which the gold may be put on paper, and dried " for uſe."—A gold powder of a more intenſe yellow colour, brighter than this, may be made by a precipitation from gold diſſolved in *aqua regia*, by means of either green or Roman vitriol, in this manner.—

ner.—" Take a ſolution of gold in *aqua regia*; and " add to it gradually, a ſolution of green vitriol or " copperas in water, till it appear that no further " precipitation of the gold be made, on adding a " freſh quantity. The ſolution of the copperas may " be made, by putting one drachm of it powdered " into an ounce of water, and ſhaking them till " the whole appear to be diſſſolved. After which " the ſolution muſt ſtand; and the clear part be " poured off from the ſediment, if any be found. " The fluid muſt be poured off from the precipitated gold, as ſoon as it is perfectly ſubſided: and the precipitation muſt be well waſhed, by pouring on it ſeveral ſucceſſive quantities " of water. Roman or blue vitriol may be employed for this purpoſe inſtead of the green, but it is " ſomewhat dearer, and has no advantage over the " other. The gold precipitates thus obtained is very bright and ſhining. A ſimilar kind may be " prepared, by putting flat bars or plates of copper " into the ſolution of the gold in *aqua regia:* but " the precipitate is of a brown colour, without any " luſter or ſhining appearance."—The German gold powder, which is the kind moſt generally uſed, and, where it is well ſecured with varniſh, will equally anſwer the end in this kind of gilding with the genuine, may be prepared from the ſort of leaf gold, called the *Dutch gold*, exactly in the ſame manner as the true. The *aurum Moſaicum*, which is tin coloured, and rendered of a flaky or pulverine texture, by a chemical proceſs, ſo as greatly to reſemble gold powder, may be likewiſe uſed in this kind of gilding; and prepared in the following manner.——" Take of tin one pound, of flowers of ſulphur ſeven ounces, and of *ſal Ammoniacus* and purified " quickſilver each half a pound. Melt the tin; " and add the quickſilver to it in that ſtate: and " when the mixture is become cold, powder it, and " grind it with the *ſal Ammoniacus* and ſulphur, till " the whole be thoroughly commixt. Calcine them " then in a mattraſs; and the other ingredients ſubliming, the tin will be converted into the *aurum* " *Moſaicum*;

" *Moſaicum*; and will be found in the bottom of the " glaſs like a maſs of bright flaky gold powder: " but if any black or diſcoloured parts appear in it, " they muſt be carefully pickt or cut out."——The *ſal Ammoniacus* employed ought to be perfectly white and clean; and care ſhould be taken, that the quickſilver be not ſuch as is undulterate with lead; which may be known, by putting a ſmall quantity in a crucible into the fire, and obſerving, when it is taken out, whether it be wholly ſublimed away, or have left any lead behind it. The calcination may be beſt performed in a coated glaſs body, hung in the naked fire; and the body ſhould be of a long figure, that the other ingredients may riſe ſo as to leave the coloured tin clear of them. The quickſilver, though it be formed into cinnabar along with the ſulphur, need not be waſted; but may be revived, by diſtilling it with the addition of quick-lime; for which a very cheap and commodious method and apparatus may be found in a late treatiſe on practical chemiſtry, intitled, *The Elaboratory laid open*, &c. There are ſome other coarſer powders in imitation of gold, which are formed of precipitations of copper. But as they are ſeldom uſed now for gilding, I ſhall defer ſhewing the manner of preparing them, till I come to ſpeak of bronzing, where they more properly occur. Beſides theſe powders, the genuine leaf or Dutch gold may be uſed with the japanners gold ſize, where a more ſhining and gloſſy effect is deſired in the gilding. But in that kind of gilding which is intended to be varniſhed over, or to be mixed with other japan work or paintings in varniſh, the powders are moſt frequently employed. The gilding with japanners gold ſize may be practiſed on almoſt any ſubſtance whatever, whether wood, metal, leather, or paper: and there is no further preparation of the work neceſſary to its being gilt, than the having the ſurface even and perfectly clean. The manner of uſing the japanners ſize, is this. Put then a proper quantity of it, prepared as above directed, and mixt with the due proportion of oil of turpentine and vermilion, into a ſmall gally pot, or one of thoſe tin veſſels above deſcribed, for containing the colours when uſed for painting in varniſh. Then either ſpread it with a bruſh over the work, where the whole ſurface is to be gilt; or draw with it, by means of a pencil, the proper figure deſired, avoiding carefully to let it touch any other parts. Suffer it afterwards to reſt till it be fit to receive the gold: which muſt be diſtinguiſhed by the finger, in the ſame manner as with the fat oil; the having a proper clammineſs or ſticky quality, without being ſo fluid as to take to the finger, being alike the criterition in both caſes. Being found of a proper dryneſs, when the gold powders are to be uſed, a piece of the ſoft leather, called *waſh-leather*, wrapt round the forefinger, muſt be dipt in the powder, and then rubbed very lightly over the ſized work; or, what is much better, the powder may be ſpread by a ſoft camel's hair pencil. The whole being covered, it muſt be left to dry; and the looſe powder may then be cleared away from the gilded part, and collected, by means of a ſoft camel's hair bruſh. When leaf gold is uſed, the method of ſizing muſt be the ſame as for the powders: but the point of due dryneſs is very nice and delicate in theſe caſes. For the leaves muſt be laid on while the matter is in a due ſtate, otherwiſe the whole of what is done muſt be ſized and gilt over again. When more gold ſize is mixt up with the oil of turpentine, and vermilion, than can be uſed at one time, it may be kept, by immerſing it under water till it be again wanted: which is indeed a general method of preſerving all kind of paint, or other ſuch compoſitions as contain oily ſubſtances.

Of gilding paper, vellum, or parchment.] There are a variety of methods uſed for gilding paper, according to the ſeveral ends it is deſigned to anſwer; but for the moſt part ſize, properly ſo called, and gum water, are uſed as the cements; and the powders are more generally employed than the leaf gold. As I have given the preparation of theſe ſeveral ſubſtances before, it is needleſs to repeat them here; and I ſhall therefore only point out thoſe circumſtances in the manner of their uſe, which are peculiar to the application of them to this purpoſe.

Of the gildings on paper proper to be uſed along with painting in water colours, or freſco.] The gilding proper to be uſed with water colours may be either with the leaf gold, or powder; which laſt, when mixt with the proper vehicle, is called *ſhell gold*. The leaf gold is neceſſary in all caſes, where a metalline and ſhining appearance is wanted: and it may be laid on the deſigned ground, by means either of gum water, or iſinglaſs ſize. The gum water or ſize ſhould be of the weaker kind, and not laid too freely on the ground; and proper time ſhould likewiſe be given for it to dry: the judgment on which muſt be formed, in this caſe, as in the other kinds of gilding, by touching with the finger. The management of the gold alſo is much the ſame in this as in the former: and where a poliſhed appearance is wanting, the dog's tooth or other kind of burniſher may be uſed. In the gilding larger ſurfaces, it will be found advantageous to colour the ground with the gall ſtone: and where colours are to be laid on the gilding, the bruſhing the gold over with the gall of any beaſt, will make it take them in a much more kindly manner. When the gold powders are uſed along with paintings in water colours, it is previouſly formed into *ſhell gold*, (as it is called, from its being uſually put into muſcle ſhells, in the ſame manner as the colours.) This ſhell gold is prepared, by tempering the gold powder with very weak gum water; to which a little ſoap-ſuds may be put, to make the gold work more eaſily and freely. The preparation of the gold powders is before given, p. 15, and that of the gum water, may be thus prepared.—" Take " three quarters of an ounce of gum Arabic, and a " quarter of an ounce of gum Senegal. Powder " them; and then tie them up in a linen rag; leav" ing ſo much unfilled room in the bag, as to admit " its being flattened by the preſſure of the hand. " Having ſqueezed the bag till it be flat, put it in-

" to a quart of hot water; and there let it continue, " moving it ſometimes about, and ſtirring the wa- " ter, for about twenty-four hours. The gums will " then be diſſolved; and the bag muſt be taken out. " The fluid being divided into two parts, to one " half of it add a quarter of an ounce of white ſu- " gar-candy powdered; and keep the other in its " pure ſtate. By this means, a ſtrong and weak gum " water, each proper for their particular purpoſes, " will be obtained."

Of the gilding proper for the coloured paper for binding books, and other ſuch purpoſes.] This kind of gilding is performed in much the ſame manner as that for mixing with paintings in water colours; except with regard to the following particulars. Firſt, in this caſe, the gilding being intended generally to form ſome figure or deſign, the gum water or ſize, inſtead of being laid on with a bruſh or pencil, is moſt generally conveyed to the ground by means of a wooden plate, or print, and moſt expediently by an engraved roller, which make an impreſſion of the figure or deſign intended. Secondly, as the riſing of the gold from the ſurface of the ground is no diſadvantage in this kind of gilding, as it is in that mixt with paintings, the gum water or ſize may be much ſtronger; which will contribute both to bind the gold firmer, and to give it a ſort of emboſſed appearance, that improves the effect. In this kind of gilding, the japanners gold ſize may be alſo commodiouſly employed. For, as the paper muſt be moiſtened before it be printed, there is no inconvenience liable to happen from the running of the gold ſize thus uſed. Where the emboſſed appearance is wanted in the greateſt degree, the gold ſize ſhould indeed always be uſed: and in this caſe ſhould be thickened with yellow oker, mixt with as much red-lead, as the proper working of the print will admit. The wooden plates or prints uſed for gilding in this manner, are worked by the hand, and are to be charged with the gum water or ſize, of whatever kind it be, by letting it gently and evenly down on a cuſhion on which the gum water or ſize has been copiouſly ſpread by means of a proper bruſh; and then preſſing it on the paper prepared by moiſtening with water, and laid horizontally with ſome ſheets of other paper under it. Where the rolling print is employed, the gum water or ſize muſt be laid on it by a proper bruſh, immediately out of the pot or veſſel which contains it: but too copious an uſe muſt be avoided, for fear of ſpreading it beyond the lines of the deſign or pattern. The ſubſequent management of the gold, whether leaf or powder, muſt be the ſame as in the foregoing kinds of gilding. It rarely anſwers to uſe the leaf gold in this kind of painting, nor even the true gold powder: but the German powder, or that formed of the leaves called *Dutch gold*, is moſtly employed, and anſwers well enough the purpoſe. The manufactures of the gilt and marbled papers have not been ſo much cultivated in our own country, as it were to be wiſhed, ſince very great ſums have been always annually paid, both to Germany and Genoa, on this account. The improvement of this manufacture is, therefore, a very fit object of attention to that moſt laudable ſociety for the eſtabliſhment and encouragement of uſeful arts, who have offered premiums to thoſe who would give proofs of their endeavours or ſucceſs in parallel inſtances. This ſociety has accordingly given lately a bounty to Mr. Moor, of Newgate-ſtreet, who has eſtabliſhed a manufacture of gilt and flowered paper; which exceeds greatly the foreign in beauty, and is ſold at a cheaper rate than that can be afforded, even when the duty on importation is not paid.

Of gilding proper for letters of gold on paper, and the embelliſhment of manuſcripts.] The moſt eaſy and neat method of forming letters of gold on paper, and for ornaments of writings, is, by the *gold ammoniac*, as it was formerly called: the method of managing which is as follows.—"Take gum Ammoniacum, "and powder it; and then diſſolve it in water pre-"viouſly impregnated with a little gum Arabic, and "ſome juice of garlic. The gum Ammoniacum

" will not diſſolve in water, ſo as to form a tranſpa-
" rent fluid, but produces a milky appearance ;
" from whence the mixture is called in medicine the
" *lac Ammoniacum*. With the lac Ammoniacum thus
" prepared, draw with a pencil, or write with a pen
" on paper, or vellum, the intended figure or letters
" of the gilding. Suffer the paper to dry ; and
" then, or any time afterwards, breathe on it till it
" be moiſtened ; and immediately lay leaves of gold,
" or parts of leaves cut in the moſt advantageous
" manner to ſave the gold, over the parts drawn or
" written upon with the lac Ammoniacum ; and
" preſs them gently to the paper with a ball of cot-
" ton or ſoft leather. When the paper becomes
" dry, which a ſhort time or gentle heat will ſoon
" effect, bruſh off, with a ſoft pencil, or rub off by
" a fine linen rag, the redundant gold which cover-
" ed the parts between the lines of the drawing or
" writing ; and the fineſt hair ſtrokes of the pencil
" or pen, as well as the broader, will appear per-
" fectly gilt."—It is uſual to ſee in old manuſcripts, that are highly ornamented, letters of gold which riſe conſiderably from the ſurface of the paper or parchment containing them, in the manner of emboſſed work ; and of theſe ſome are leſs ſhining, and others have a very high poliſh. The method of producing theſe letters is of two kinds ; the one by friction on a proper body with a ſolid piece of gold : the other by leaf gold. The method of making theſe letters by means of ſolid gold is as follows.——
" Take chryſtal ; and reduce it to powder. Temper
" it then with ſtrong gum water, till it be of the con-
" ſiſtence of paſte ; and with this, form the letters.
" When they are dry, rub them with a piece of gold
" of good colour, as in the manner of poliſhing ;
" and the letters will appear as if gilt with burniſh-
" ed gold."——Kunckel has, in his fifty curious experiments, given this recipe : but omitted to take the leaſt notice of the manner, how theſe letters are to be formed ; though the moſt difficult circumſtance in the production of them. It may, however, be

done by means of a ſtamp in this manner. Let the emboſſed figure, either of the ſeparate letters or of whole words, be cut in ſteel; and, when the ſtamps are to be uſed, anoint each letter carefully with the end of a large feather dipt in oil; but not ſo wet as to leave drops in the hollows of the ſtamps. Fill theſe concave letters, in the ſtamps, with the above mixture of powdered chryſtal and gum water; and, wiping the other parts of them perfectly clean, place them then on the paper or vellum, laid over ſome ſheets of paper; taking care, that the letters may be in the exact poſition where they ought to lie: ſtrike then the ſtamp in a perpendicular direction, but not too forcibly; and take it off in the ſame direction. The letters will be left in their proper places by this means, and will have the ſame proportions as their archetypes in the ſtamps. Where leaf gold is uſed for making emboſſed letters in manuſcripts, the above compoſition cannot be uſed; but there are ſeveral others, which will very well ſupply its place: of which the following has been given as very excellent."—" Take the whites of eggs; and beat them " to an oily conſiſtence. Then take as much ver" milion as will be required to thicken the whites of " the eggs to the conſiſtence of paſte. Form the " letters of this paſte, by means of the ſtamps, in " the manner before directed; and when they are " become dry, moiſten them by a ſmall pencil with " ſtrong gum water; obſerving not to let it run be" yond the bounds of the letters. When the gum " water is of a proper dryneſs, which muſt be judg" ed of by the rule before given, cover the letters " with leaf gold; and preſs it cloſe to every part of " them, by cotton or ſoft leather. After the gild" ing is dry, it may be poliſhed by the dog's tooth, " or the other proper burniſhers."

Of gilding proper for the edges of books and paper.] There are ſeveral various methods, with reſpect to the cement uſed, by which the edges of books or paper may be gilt: as ſtrong gum water, or iſinglaſs ſize, or glovers ſize, may be employed: but as the gum water, and weaker ſizes, are apt to run beyond the edge; and ſtick the leaves together, iſinglaſs melted with the addition of ſome common proof ſpirit of wine, and a ſixth part of honey or ſugar-candy is greatly preferable: but a third of bole ammoniac well powdered muſt be added. The following compoſition has been likewiſe approved of for this purpoſe.——"Take bole ammoniac, and ſugar-candy "well powdered, each equal parts: mix them with "the whites of eggs beaten to an oily conſiſtence; "and the cement will be fit for uſe."——In order to the uſing any of theſe cements, the paper, whether it be in quires, or books, ſhould be well cut, and poliſhed on the edges to be gilt; and then ſtrongly ſcrewed down by a preſs: in which ſtate, it is to be bruſhed over, firſt with a little of the cement without the ſugar-candy, or the bole; and when that is dry, either with the cement above given, or any other ſolution of gum or ſize with the proper proportion of the bole: after which it may be ſuffered to dry; and then water poliſhed, by rubbing it with a fine linen rag ſlightly moiſtened. It is then in a ſtate fit for receiving the gold; only it muſt be again gently moiſtened at that time: and the leaves may then be laid on, being cut according to the breadth they are to cover; and preſſed cloſely down by a cotton ball: and after the gilding is thoroughly dry and firm, it may be poliſhed in the manner of the foregoing kinds.

Of gilding leather.] Leather may be gilded for common occaſions by all the ſame methods which have been given for gilding paper, or vellum; except, that where the gold ſize is uſed, there is no occaſion to wet the leather, to prevent the running of the oil out of the bounds. Either leaf gold or the powders may therefore be employed as well for leather, as paper. But, unleſs in ſome fine work, or for very particular purpoſes, the German gold powder would anſwer as well as the true gold. It is needleſs conſequently to repeat here the methods above ſhewn with reſpect to the gilding paper for covers to books, &c. which equally well ſuit for this purpoſe in general: but as there is a manner of gilding leather peculiar to the book-binders, it is requiſite to explain it. The method of gilding uſed by the book-binder, is to have the letters, or compartments, ſcrolls, or other ornaments, cut in ſteel ſtamps; not by ſinking, as in moſt other caſes, but by the projection of the figure from the ground. Theſe ſtamps are made hot; and leaves of gold being laid on the parts accommodated to the pattern or deſign of the gilding, the hot ſtamps are preſt ſtrongly on the gold and leather; and bind the gold to it in the hollows formed by the ſtamp: the other redundant part of the gold being afterwards bruſhed or rubbed off. The manner practiſed by the profeſſed leather-gilders for the making hangings for rooms, ſkreens, &c. is not properly *gilding*, but *laquering*, being done by means of leaf ſilver, coloured by a yellow varniſh, on the ſame principle with the laquered frames of pictures, &c. which were formerly in uſe. It is an important manufacture, as the leather ornamented in this manner, not only admits of great variety of deſigns in emboſſed work, reſembling either gilding or ſilver; but alſo of the addition of paintings of almoſt every ſort. The manner of performing this kind of leather gilding is as follows. The ſkins are firſt procured in a dry ſtate, after the common dreſſing and tanning. Thoſe moſt proper for this purpoſe, are ſuch as are of a firm cloſe texture: on which account, calf, or goat ſkins are preferable to ſheep. But in that condition they are too hard and ſtiff for gilding in this way. In order therefore to ſoften them, they are firſt put for ſome hours in a tub of water; where they are, during ſuch time, to be frequently ſtirred about with a ſtrong ſtick. They are then taken out; and, being held by one corner, beaten againſt a flat ſtone. They are next made ſmooth, by ſpreading them on the ſtone, and rubbing them ſtrongly over by an iron inſtrument reſembling a blade, but with the lower edge formed round, and the upper edge ſet in a

wooden

wooden handle, paſſing horizontally the whole length of the blade. This inſtrument the workman ſlides on the ſurface of the ſkin as it lies on the ſtone, at the ſame time preſſing and leaning on it with all his weight. When one of the ſkins is finiſhed, another is laid over it, and treated in the ſame manner; and the others over that. The ſkins being thus prepared, are joined together, to form pieces of the ſize required for any particular purpoſe. In order to their joining properly, they are cut into a ſquare, or rather oblong ſquare form. To which end, a ruler or ſquare is uſed, or the ſkins are placed on a table or block, correſponding in ſize and figure to a wooden print of the kind we ſhall have occaſion to ſpeak of below, and as much of the ſkins is taken off, as leaves it of the form and dimenſions of the table or block. Any defective parts, or holes in the ſkin, are then to be made good; which is done by paring away with a penknife, half the thickneſs of the ſkin for ſome little ſpace round the hole, or defective part; putting a patch, or correſpondent piece of the ſame kind of ſkin over it. This patch, or piece, is to have a margin pared to half the thickneſs, to ſuit the pared part of the ſkin; and is then to be fixed in its place, by means of ſize made of parchment, or glovers cuttings, in the manner deſcribed before, p. 10. After the ſkins are thus prepared, the next operation is the ſizing them, which is done by means of a kind of ſoft glue, or ſtiff ſize, that anſwers to the gold ſize, uſed in other kinds of gilding or ſilvering, prepared from parchment, or glovers cuttings. This is, in fact, the ſame with that directed to be uſed for joining the pieces; only it muſt be reduced by longer boiling to a thicker conſiſtence, which ſhould be that of a very ſtiff gelly. To ſize a ſkin or piece, the workman takes a piece of the ſize of the bigneſs of a nut: which, however, he does not uſe whole, but cuts into two parts. With one of theſe parts, he rubs all the ſkin, or piece of leather, ſtrongly; and when it is, by this means, ſpread over the whole ſurface of the leather, he rubs it with the palm of his hand to diſperſe it more equally, and uniformly over every part. To the effecting this end, the heat of the hand contributes as well as the motion: as it melts the ſize to a certain degree of fluidity, and renders it conſequently more capable of being diffuſed over the whole ſurface. The workmen then leaves the ſkin for ſome time to dry, and afterwards ſpreads the other part of the ſize on it, in the ſame manner as the firſt; which finiſhes the operation of ſizing. It is neceſſary to allow ſome ſpace of time betwixt the laying on the two parts of the ſize. For if the whole was laid on together; or the firſt part before the other was dry to a certain degree, the whole would diſſolve, and be forced forwards before the hand, inſtead of being ſpread by it. In the proſecution of this buſineſs, the workman therefore, as ſoon as he has ſpread the firſt part of the ſize, takes another ſkin, and treats it in the ſame manner: which filling up the interval of time, proper for drying the firſt, he returns then to that, and puts on the other part of the ſize, and by this alternative treatment of them, employs the whole of his time, without any loſs, by waiting till either be dry. The ſide of the ſkin on which the hair grew, or what is called the *grain* of the leather, is always choſen for receiving the ſize and ſilver. This is neceſſary to be obſerved: becauſe that ſide is evener, and of a cloſer texture than the other. The ſkins, being thus ſized, are ready for receiving the leaves of ſilver: which are thus laid on. The workman, who ſilvers them, ſtands before a table; on which he ſpreads two ſkins before they are dry after the ſizing. On the ſame table, on the right hand, he puts alſo a large book of leaf ſilver on a board, which, near one end of it, has a peg ſufficiently long to raiſe it in ſuch manner, as to make it ſlope like a writing deſk. The book being thus placed, he takes out one by one the leaves of ſilver, and lays them on the ſkin previouſly ſized as above. This he does by means of a ſmall pair of pincers, formed by two little rods of wood faſtened together at one end, and glued to a ſmall piece of wood, cut into the form of a triangle, intended to keep the ends of the two rods at a diſtance from each other; and to make them anſwer the purpoſe, when preſſed by the fingers, of taking hold of the leaves of ſilver. On the ſide of the piece in which the rods are joined to form the pincers, there is put a kind of tuft, or ſmall bruſh, of an irregular form, made of foxes, or any other kind of ſoft hair. With theſe pincers, the workman takes hold of one of the leaves in the book, and puts it on a piece of cartoon, larger than the leaf, of a figure nearly ſquare; and which has the corners of the end, that is to be placed in the hand of the workman, bent. This piece of cartoon is called a palet. The workman takes it in his left hand; and, having put on it a leaf of ſilver, he turns it downward; and lets the leaf fall on the ſkin, ſpreading it as much as he can, and bringing, as near as poſſible, the ſides of it, to be parallel to thoſe of the ſquare of leather, or ſkin. If it happen, that any part of it gets double, or is not duly ſpread, he ſets it right; raiſes it ſometimes, and puts it in its place, or rubs it gently with the kind of bruſh, or hair pencil, which is at the end of the pincers. But moſt generally, the workman only lets the leaf fall in its place, ſpread out on the ſurface of the leather, without either touching or preſſing it; except in the caſe we ſhall mention below. After he has done with this leaf, he lays a new one in the ſame line, and continues the ſame till ſuch line be complete. He then begins cloſe to the edge of this row of leaves, and forms another in the ſame manner; and goes on thus, till the whole ſkin be entirely covered with the leaf ſilver. This work is very eaſily and readily performed; as the leaves, which are of a ſquare form, are put on a plain ſurface, which is alſo rectangular. The ſkin being thus covered with the ſilver, the workman takes a fox's tail, made into the form of a ball at the end, and uſes it to ſettle the leaves, by preſſing and ſtriking them, to make them adhere to the ſize, and adopt themſelves exactly to the places they are to cover. He afterwards rubs the whole ſurface gently with the tail, without ſtriking, which is done to take off the looſe and redundant parts of the ſilver, and at the ſame time to move them to thoſe places of the ſurface, where there was before any defect of the ſilver; and where, conſequently, the ſize being bare, theſe will now take. The reſt of the looſe ſilver is bruſhed forwards to the end of the table, where a bag, or linen cloth, is placed to receive it. The ſkins, when they are thus ſilvered, are hung to dry on cords, fixt by the ends to oppoſite walls, at ſuch height as to ſuſpend the ſkins out of the way of the workman. To hang them on theſe cords, a kind of croſs is uſed, formed of a ſtrong ſtick, with a ſhorter piece of the ſame fixed croſſwiſe at the end of it; over which the ſkin being hung without any doubling, and with the ſilvered outwards, it is conveyed and transferred to the cord in the ſame ſtate. The ſkins are to dry in this condition, a longer or ſhorter time, according to the ſeaſon and the weather. In ſummer, four or five hours is ſufficient; or thoſe ſkins which have been ſilvered in the morning, may remain till the evening, and thoſe in the evening, till next morning. But in winter a longer time is required, according to the ſtate of the weather. There is no occaſion, nevertheleſs, to wait till they be intirely dry. As they may be put in any back yard or garden expoſed to the wind, and the heat of the ſun. For this purpoſe they ſhould be put over two boards joined together, where they muſt be kept ſtretched out by means of ſome nails. But in this caſe, the ſilvered ſide muſt be next the boards, in order to prevent any dirt from falling on it, and ſticking to the ſize, which would hinder their taking well the burniſh, that will be mentioned below. The heat, and the dryneſs of the air, muſt determine, alſo, the time of their hanging in this ſtate: but experience alone can teach how to judge of this point. It is proper the ſkin ſhould be free from moiſture; but yet, that they ſhould retain all their ſoftneſs: in ſummer this will happen in a few hours, and they will be then in a condition to be burniſhed. The burniſher which is uſed for this purpoſe, is a flint, of which various figures may be allowed, and which muſt be mounted differently with a handle, according to the difference of the figure. A cylindrical form is often choſen; in which caſe, one of the ends ſhould be of a round figure, of about an inch and a half diameter, and have the ſurface extremely ſmooth; as the poliſhing is performed with this ſurface. The flint is fixed in the middle of a piece of wood of a foot length, the whole of which length is neceſſary to its ſerving as a handle; or the workman takes hold of it at each end, with each of his hands, thoſe parts being roundiſh, and the middle being left of a greater thickneſs, in order to admit of a hole of a proper depth for receiving the flint, ſo as to keep it quite firm and ſteady. All the art required in the manner of burniſhing is, to rub the leaf ſilver ſtrongly; for which purpoſe, the workman applies both hands to the burniſher, dwelling longer on thoſe parts which appear moſt dull. In order to perform this operation, the ſkin is put and ſpread even on a ſmooth ſtone of a requiſite ſize, placed on a table, where it may be ſo firm and ſteady, as to bear all the force of preſſure the workman can give in ſliding the burniſher backwards and forwards over every part of the ſkin, It would ſave a great deal of labour to employ, inſtead of this method of burniſhing, that uſed by the poliſhers of glaſs, and alſo by the card-makers. This method conſiſts in fixing the burniſher at the end of a ſtrong crooked ſtick, of which, the other end is faſtened to the ceiling. The ſtick being ſo diſpoſed, as to act as a ſpring, of which the force bears on the ſkin, it exempts the workman from this part of the labour, and leaves him only that of ſliding the burniſhers along the ſkin, in the directions the poliſhing requires. The objections to this method are, that ſome parts of the ſkin require a greater preſſure than others, and that ſometimes dirt ſticking to the ſize, which paſſes through the joining of the ſilver, will ſcratch the work, if the workman in going along did not ſee and remove it, which he cannot ſo well do in uſing the ſpring burniſher. But certainly, theſe inconveniencies have obvious remedies, when they are underſtood. The uſing the ſpring burniſher for the greateſt part of the work, does not prevent taking the aid of the common one for finiſhing, if any parts, that appear imperfecty poliſhed, ſhall render it neceſſary; and the workman may well afford the trouble of examining the ſkin, and cleanſing it thoroughly, by the labour he will ſave in this way, or, perhaps, it is always beſt to do this office, before any kind of poliſhing be begun, rather than to leave it to be done during the poliſhing. In ſome manufactures, the burniſhing is performed, by paſſing the ſilvered ſkins betwixt two cylindrical rollers of ſteel, with poliſhed faces. If this be well executed, it muſt give a conſiderable brilliance to the ſilver; and take away all thoſe warpings and inequalities in the leather, which tend to render the ſilvered ſurface leſs equal and ſhining. The ſkins or leather, being thus ſilvered and burniſhed, are now prepared to receive the yellow laquer or varniſh, which gives the appearance of gilding. The perfection of this work depends, obviouſly, in a great degree, on the colour, and other qualities of the compoſition uſed as ſuch varniſh: for which different artiſts in this way have different recipes; each pretending, in general, that his own is beſt, and making conſequently a ſecret of it. The following is, however, at leaſt equal to any hitherto uſed; and may be prepared without any difficulty, except ſome little nicety in the boiling.—" Take of fine white reſin four pounds " and a half; of common reſin the ſame quantity; " of gum ſandarac two pounds and a half; and of " aloes two pounds. Mix them together, after hav" ing bruiſed thoſe which are in great pieces; and " put them into an earthen pot, over a good fire " made of charcoal, or over any other fire where " there is no flame. Melt all the ingredients in this " manner, ſtirring them well with a ſpatula, that " they may be thoroughly mixt together, and be " prevented alſo from ſticking to the bottom of the

" pot. When they are perfectly melted and mixt, " add gradually to them, ſeven pints of linſeed oil, " and ſtir the whole well together with the ſpatula. " Make the whole boil, ſtirring it all the time, to " prevent a kind of ſediment, that will form, from " ſticking to the bottom of the veſſel. When the " varniſh is almoſt ſufficiently boiled, add gradually, " half an ounce of litharge, or half an ounce of red " lead; and when they are diſſolved, paſs the var" niſh through a linen cloth, or flannel bag."—The time of boiling ſuch a quantity of varniſh, may be in general about ſeven or eight hours. But as the force of the heat, and other circumſtances, may vary, it does not permit of any preciſe rule. The means of judging of this, is by taking a little quantity out of the pot, with a ſilver ſpoon, or other ſuch inſtrument, and touching it with the finger; when, if the varniſh appear, on cooling, of the conſiſtence of a thick ſyrup; become ſoon after ropy, and then drying, glue the fingers together, and give a ſhining appearance; it may be concluded, the time of boiling is ſufficient. But if theſe ſigns are found wanting, the contrary muſt be inferred; and the boiling muſt be continued till they do ariſe. When the quantity of ingredients is diminiſhed, the time of boiling may be alſo contracted. A pint of oil, and a correſpondent proportion of fine reſin and aloes, has produced a varniſh perfectly good in an hour and a half. In this proceſs, it is very neceſſary to have a pot, that will not be half filled with all the ingredients; and alſo to guard with the greateſt caution againſt any flame coming near the top of the pot, or the vapour, which riſes from it during the boiling. For it is of ſo combuſtible a nature, it would immediately take fire; and the ingredients themſelves would burn in ſuch a manner, as would not only defeat the operation, but occaſion the hazard of other inconveniencies. The varniſh thus prepared, attains a brown appearance; but, when ſpread on ſilver, gives it a colour greatly ſimilar to that of gold. If, however, it ſhould not be found, after this proceeding, that the force of yellow was ſufficiently ſtrong, an addition of more aloes muſt be made before the boiling be diſcontinued. Care muſt be taken, nevertheleſs, in doing this, not to throw in a large lump at once; becauſe ſuch an efferveſcence is excited, in that caſe, as would endanger the varniſh riſing over the edge of the veſſel, and producing a flame, that would inſtantly make the whole take fire. On the other hand, if the varniſh ſeem too ſtrong of the colour, ſandarac muſt be added with the ſame precaution, which increaſing the quantity of varniſh, will dilute the colour. The laying the laquer, or varniſh, on the ſilvered leather, is performed in the open air: and ſhould be done in ſummer, when it is hot and dry. It is thus performed. The ſkins are again to be ſtretched and faſtened with nails to the ſame boards on which they were before fixt to complete the drying after the ſilvering: but with this difference, that the ſilvered ſide muſt be outwards. Eighty or twenty ſkins may be treated thus at the ſame time: there being two or three on each board. All the boards ſhould be then ranged on treſſels parallel to each other, in ſuch manner, that all, both of them and the ſkins, may be cloſe to each other. Every thing being thus prepared, the principal workman ſpreads ſome of the white of eggs over each ſkin. The uſe of this is to fill up ſmall inequalities in the ſurface of the ſkin; and to prevent the varniſh paſſing through the interſtices of the ſilver, and being abſorbed by the leather. Some omit this: and with advantage, if theſe inconveniencies could be avoided without it: as it renders the varniſh more apt to crack and peel off the ſilver. But where it is omitted, the varniſh ſhould be of a thicker conſiſtence; the ſurface of the leather of a firm denſe texture; and the leaves of ſilver of a greater thickneſs than the common. When the white of eggs is dry, the workman who lays on the varniſh ſets it on the table before him in a pot; being, as before directed, pretty near the conſiſtence of a thick ſyrup. He then dips the four fingers of one of his hands in the varniſh; and uſes them as a pencil to ſpread it on the ſkin. In doing this, he holds the fingers at a ſmall but equal diſtance from each other, and putting the ends of them on the ſkin near one of the edges of it; and he then moves his hands ſo, that each finger paints a kind of *S* with the varniſh, from one end of the ſkin to the other. He afterwards dips his fingers again in the varniſh, and repeats the ſame operation again on the next part of the ſkin, till the whole be gone over in the ſame manner. This might be done with a pencil or proper bruſh: but the workman finds the uſing the fingers only, to be the readieſt method for diſtributing the varniſh equally over the ſkin. After the varniſh is thus laid on the ſkin, it is to be ſpread: which is ſtill done by the hand ſolely. The method is, to rub the flat of the open hand over every part of the ſkin on which the varniſh has been put by the fingers, and by that means diffuſe it evenly over every part. After this, it is to be immediately beaten by ſtrokes of the palms of the hands, which are to be frequently repeated on every part in general, but in a greater degree on thoſe places where the varniſh appears to lie thicker than on the reſt: and in doing this, both hands are, for diſpatch, employed at the ſame time. When this operation is finiſhed, the ſkins are ſtill to be left on the boards where they were ſtretcht and nailed; and thoſe boards are, therefore, either continued till that time on the treſſels where the varniſh was put on the ſkin; or, if they be wanted for freſh ſkins, taken off, and fixt up againſt the wall of the place, or any other proper ſupport. The time of drying depends of courſe on the heat of the ſun and weather: but at a ſeaſonable time does not exceed a few hours. It is to be known, as to each particular parcel of ſkins, by examining them with the finger. If on touching them, they be found free from any ſtickineſs, or, in the ſtyle of workmen, tackineſs, or that the finger makes no impreſſion on the varniſh, they may be concluded ſufficiently dry; and the contrary, when they are found to be otherwiſe. This coat of varniſh being dry, the ſkins are to be again put on the treſſels as before, and another coat laid on exactly in the ſame manner as the firſt. In doing this, examination muſt be made, whether any of the ſkins appear ſtronger or weaker coloured than the others; in order that the defect may be now remedied, by making this coat thicker or thinner, as may appear neceſſary. When this coat is dry, the varniſhing for producing the appearance of gilding is completed: and if it has been well performed, the leather will have a very fine gold colour, with a conſiderable degree of poliſh or brightneſs. When there is an intention to have one part of the leather ſilver, and the other gold, a pattern is formed on the ſurface, by printing, calking, or ſtamping a deſign on the ſurface after the ſilvering. The ſkin is then to be varniſhed, as if the whole were intended to be gold; but after the laſt coat, inſtead of drying the varniſh, it is to be immediately taken off that part which is intended to be ſilver, according to the deſign printed or calked upon it, by a knife; with which the workman ſcrapes off all that he can without injuring the ſilver, and afterwards by a linen cloth, with which all that remains is endeavoured to be wiped or rubbed off. The ſkins, being thus ſilvered and varniſhed, are made the ground of various deſigns for emboſſed work and painting. The emboſſed work or relief is raiſed by means of printing with a rolling preſs, ſuch as is uſed for copper plates; but the deſign is here to be engraved on wood. The painting may be of any kind: but oil is principally uſed, as being durable and moſt eaſily performed. There is nothing more neceſſary in this caſe, than in painting on other grounds, except that, where varniſh or water is uſed, the ſurface be clean from any oily or greaſy matter.

Of gilding of glaſs without annealing or burning.] Glaſs may be gilt, by applying as a cement any gold ſize, or other ſize, gum water, or varniſh; and, when it is of a proper degree of dryneſs, laying on the gold, as in the other methods of gilding. The work may alſo be poliſhed afterwards in the ſame manner, if the burniſht appearance be deſired: but where that is intended, it is proper to add bole ammoniac, chalk, or other ſuch ſubſtance, to the cement. When drinking glaſſes are to be gilt, without burning, the cement ſhould be either ſome gold ſize formed of oil, or ſome kind of varniſh compounded of the gum reſins, that will not diſſolve in water; but require either ſpirit of wine or oil of turpentine for their ſolution. At preſent, nevertheleſs, this is not only neglected by thoſe who gild drinking glaſſes for ſale; but glaſſes gilded with gum arabic, or the ſizes which will diſſolve in water, are impoſed upon the public for the German glaſſes gilt with the annealed gold; and ſold at a dear rate under that pretence; though after they have been uſed for a very ſhort time, the gold peels and rubs off in ſpots when the glaſſes are cleaned; and renders them very unſightly. As the glaſſes with gilt edges are at preſent much in faſhion, and the true kind are brought from Germany, or elſewhere, the incitement of the cultivating this branch of gilding here would not be an unfit object of the premiums of the worthy ſociety for the encouragement of arts. Since for the doing this work in perfection, there is nothing more wanting, than that dexterity of the manœuvre, which ariſes from a little practice in matters of this kind.

Of ſilvering.] Silvering may be practiſed on the ſame ſubſtances; and by all the ſame methods, either with leaf or powder, as we have before pointed out with regard to gilding; variation being made in a few circumſtances below mentioned. It is, nevertheleſs, but ſeldom uſed, notwithſtanding the effect would be very beautiful and proper in many caſes; and there is an extreme good reaſon for ſuch a neglect of it. This reaſon is, its tarniſhing in a very ſhort time; and acquiring frequently, beſides the general depravity of the whiteneſs, ſuch ſpots of various colours, as render it very unſightly: and this tarniſh and ſpecking is not only the conſtant reſult of time; but will be often produced inſtantly by any extraordinary moiſture in the air, or dampneſs, as well as by the fumes and effluvia of many bodies which may happen to approach it. Wherever, therefore, ſilvering is admitted, a ſtrong varniſh ought to be put over it: and this even is not ſufficient wholly to ſecure it from this deſtructive conſequence. The varniſh muſt be ſome of the compoſitions of maſtic, ſanderac, the gums animi or copal, and white reſin; (the particular treatment of which in the forming varniſhes will be found in other parts of this work;) for the other ſubſtances uſed for compounding varniſhes are too yellow. Some put a coat of iſinglaſs ſize over the ſilver: but, beſides that the ſize itſelf injures the whiteneſs in time, by turning yellow, it preſerves the ſilver but in a ſmall degree. Experience has ſhewn, in the caſe of the ſilvered leather, what the varniſh may be compoſed of, that anſwers beſt for this purpoſe, and the kind before given p. 31, under that head, may be applied to other purpoſes. The methods of making the ſilver powders, is alſo the ſame as thoſe of gold, except with regard to one of the German powders, which is correſpondent both in its appearance and uſe, abating the difference of colour, to the *aurum Moſaicum* or *muſivum:* whence it has been indeed, though improperly, called the *argentum muſivum.* The proceſs for this being, therefore, different from any before given, it is proper to inſert it fully, as follows.——

" Take of very pure tin one pound. Put it into a
" crucible; and ſet it on a fire to melt: when it be-
" gins to run into fuſion, add to it an equal propor-
" tion of biſmuth or tin glaſs: and ſtir the mixture
" with an iron rod, or the ſmall end of a tobacco-
" pipe, till the whole be intirely melted, and incor-
" porated. Take the crucible then from the fire;
" and, after the melted compoſition is become a lit-
" tle cooler, but while it is yet in a fluid ſtate, pour
" into it a pound of quickſilver gradually; ſtirring
" it in the mean time, that the mercury may be
" thoroughly conjoined with the other ingredients.
" When the whole is thus commixt, pour the maſs

“ out of the crucible on a ſtone; where, as it cools, “ it will take the form of an amalgama or metalline “ paſte; which will be eaſily bruiſed into a flaky “ powder; and is then fit for uſe.”—This powder may be either tempered, in the manner of the ſhell gold, with gum water; or rubbed over a ground properly ſized, according to any of the methods above directed for gold powder; and it will take a very good poliſh from the dog's tooth or burniſhers; and hold its colour much better with a ſlight coat of varniſh over it, than any true ſilver powder or leaf. The ſizes for ſilvering ought not to be mixed, as in the caſe of gold, with yellow, or bole ammoniac; but with ſome white ſuſtbance, whoſe effect may prevent any ſmall failures in the covering the ground with the ſilver from being ſeen, in the ſame manner as the yellow ſubſtances do the gold. This may be done with flake white, or white lead, when the ſizes formed of oil are uſed: but whiting is the proper matter in the burniſh ſize for ſilvering; or wherever the glovers or parchment ſize is uſed. Some recommend tobaccopipe-clay in the place of whiting; and add a little lamp black to give a ſilver-like greyiſhneſs to the compoſition. Leather is ſilvered by thoſe who have the manufactures of hangings, ſkreens, &c. though not ſo frequently with a view to the retaining its own colour, as to produce the imitation of gilding, of which the whole proceſs is before given, p. 25. In ſome caſes, nevertheleſs, the appearance of ſilver is retained; and it is therefore proper to take ſome notice of the manner of performing this work. The proceeding in ſilvering the leather, is to be in all reſpects the ſame, as when it is to have the appearance of gilding (of which the particular manner has been before ſhewn under the article of gilding leather) till that part of the proceſs where the varniſh or laquer, which is to give the yellow colour, is to be laid on. Inſtead of this yellow varniſh, a clear colourleſs one is to be ſubſtituted, where the appearance of ſilver is to be preſerved: but this is neceſſary only, in order to prevent the tarniſh and diſcolouring, which of courſe happens in a ſhort time to ſilver expoſed in a naked and undefended ſtate to the air. The moſt common varniſh uſed for this purpoſe, is only parchment ſize, prepared as above directed, p. 10, which is preferred to others, on account of its cheapneſs. This is made warm, in order to render it fluid, and then laid on with a ſpunge inſtead of a pencil or bruſh. There is no reaſon, however, as this kind of varniſh is liable to ſuffer by moiſture, and grow foul and diſcoloured, that better kinds, ſuch as thoſe of Martin, or others, which are uſed for *papier maché*, wood, &c. ſhould not be employed here, provided they be colourleſs. The more hard and tranſparent, and the more they are of a reſinous nature, the more brilliant and white, and the more durable will be the ſilvery, and poliſht appearance of the ſilvered leather. Some, inſtead of parchment ſize, uſe that made of iſinglaſs, which may be prepared according to the method laid down, p. 10. This reſiſts moiſture, and will keep its colour and tranſparency, better than the other kinds of ſize: but all of them grow yellow and cloudy with time; eſpecially if any damp or moiſture have acceſs to them. Indeed ſilver ſecured even by the beſt varniſh will ſtill in time take a tarniſh, and loſe its beauty: and therefore the giving the leaf ſilver on leather the appearance of gold, even though attended with ſome additional expence, is preferable in moſt caſes. Leather ſilvered in this manner may be ornamented by printing in relief, and by painting, in the ſame manner as that repreſenting gilding: though, on account of the want of durability, this is much ſeldomer practiſed. It is poſſible that ſome amalgama of quickſilver, or other compoſition, might be found, that would have the reſemblance of ſilver, and yet reſiſt tarniſhing: which would not only be a great improvement, by the furniſhing a durable kind of ſilvering for leather, paper, &c. but alſo ſave part of the expence of leaf ſilver for a ground for gilded leather. This has been attempted in France with ſome ſucceſs; but not to the degree of perfection wiſhed for.

Of bronzing.] Bronzing is colouring, by metalline powders, plaſter, or other buſts and figures, in order to make them appear as if caſt of copper or other metals. This is ſometimes done by means of cement; and ſometimes without, in the inſtance of plaſter figures: but the bronzing is more durable and ſecure when a cement is uſed. The gold powders, and the *aurum Moſaicum*, we have before given the preparation of, are frequently employed for this purpoſe; but the proper bronzing ought to be of a deeper and redder colour, more reſembling copper; which effect may be produced by grinding a very ſmall quantity of red lead with theſe powders; or the proper powder of copper may be uſed: and may be prepared as follows.—" Take filings of copper, " or ſlips of copper plates; and diſſolve them in any " kind of *aquafortis* put into a glaſs receiver, or " other proper formed veſſel. When the *aquafortis* " is ſaturated with the copper, take out the ſlips of " the plates; or, if filings were uſed, pour off the " ſolution from what remains undiſſolved: and put " into it ſmall bars of iron: which will precipitate " the copper from the *aquafortis* in a powder of the " proper appearance and colour of copper. Pour off " the water then from the powder; and waſh it " clean from the ſalts, by ſeveral ſucceſſive quanti- " ties of freſh water."—Where the appearance of braſs is deſigned, the gold powders, or the *aurum Moſaicum*, may be mixt with a little of the powder called *argentum muſivum*; of which the preparation is above given. Where the appearance of ſilver is wanted, the *argentum muſivum* is the beſt and cheapeſt method: particularly as it will hold its colour much longer than the true ſilver uſed either in leaf or powder. Where no cement is uſed in bronzing, the powder muſt be rubbed on the ſubject intended to be bronzed, by means of a piece of ſoft leather, or fine linen rag, till the whole ſurface be coloured. The former method of uſing a cement in bronzing was, to mix the powders with ſtrong gum water, or iſinglaſs ſize; and then with a bruſh, or pencil, to lay them on the ſubject. But at preſent ſome uſe the japanners gold ſize: and proceed in all reſpects in the ſame manner as in gilding with the powders in other caſes: for which ample directions have been before given. This is the beſt method hitherto practiſed. For the japanners gold ſize binds the powders to the ground, without the leaſt hazard of peeling or falling off; which is liable to happen when the gum water or glovers or iſinglaſs ſizes are uſed. Though, notwithſtanding the authority of the old practice for the contrary, even theſe cements will much better ſecure them when they are laid on the ground, and the powders rubbed over them, than when both are mixed together, and the effect, particularly of the *aurum Moſaicum*, will be much better in this way than the other. The gold ſize ſhould be ſuffered, in this caſe, to approach much nearer to dryneſs, than is proper in the caſe of gilding with leaf gold, as the powders would otherwiſe be rubbed amongſt it in the laying them on. The fictitious ſilver powder, called the *argentum muſivum*, may, as above-mentioned, be applied in the manner of bronze, by thoſe whoſe caprice diſpoſes them to ſilver figures or buſts. But it is the only ſort of ſilver powder, that ſhould be uſed in this way, for the reaſon above given: and all ſuch kind of ſilvering is much better omitted. For the whiteneſs itſelf of plaſter in figures or buſts, and much more a gloſſy or ſhining whiteneſs, is injurious to their right effect; by its eluding the judgment of the eye, with reſpect to the proper form and proportion of the parts, from the falſe and pointed reflections of the lights, and the too faint force of the ſhades. To remove which inconvenience it is probable was the firſt inducement to bronzing.

Of japanning.] By japanning is to be here underſtood the art of covering bodies by grounds of opake colours in varniſh; which may be either afterwards decorated by paintings or gilding, or left in a plain ſtate. This is not at preſent practiſed ſo frequently on chairs, tables, and other furniture of houſes, except tea-waiters, as formerly. But the introduction of it for ornamenting coaches, ſnuff-boxes, and ſkreens, in which there is a rivalſhip betwixt ourſelves and the French, renders the cultivation and propagation of this art of great importance to commerce. I ſhall therefore be more explicit in ſhewing the methods both now and formerly in uſe; with the application of each to the ſeveral purpoſes to which they are beſt adapted; and point out at the ſame time ſeveral very material improvements, that are at preſent enjoyed only by particular perſons; or not at all hitherto brought into practice. The ſubſtances which admit of being japanned are almoſt every kind that are dry and rigid, or not too flexible; as wood, metals, leather, and paper prepared. Wood and metals do not require any other preparation, but to have their ſurfaces perfectly even and clean. But leather ſhould be ſecurely ſtrained either on frames, or on boards; as its bending or forming folds would otherwiſe crack and force off the coats of varniſh. Paper alſo ſhould be treated in the ſame manner; and have a previous ſtrong coat of ſome kind of ſize; but it is rarely made the ſubject of japanning till it is converted into *papier maché*, or wrought, by other means, into ſuch form, that its original ſtate, particularly with reſpect to flexibility, is loſt. One principal variation in the manner of japanning is, the uſing or omitting any priming or undercoat on the work to be japanned. In the older practice, ſuch priming was always uſed: and is at preſent retained in the French manner of japanning coaches and ſnuff-boxes of the *papier maché*. But in the Birmingham manufacture here, it has been always rejected. The advantage of uſing ſuch priming or undercoat is, that it makes a ſaving in the quantity of varniſh uſed. Becauſe the matter of which the priming is compoſed fills up the inequalities of the body to be varniſhed: and makes it eaſy, by means of rubbing and water-poliſhing, to gain an even ſurface for the varniſh. This was therefore ſuch a convenience in the caſe of wood, as the giving a hardneſs and firmneſs to the ground was alſo in the caſe of leather, that it became an eſtabliſhed method: and is therefore retained, even in the inſtance of the *papier maché*, by the French, who applied the received method of japanning to that kind of work on its introduction. There is nevertheleſs this inconvenience always attending the uſe of an undercoat of ſize, that the japan coats of varniſh and colour will be conſtantly liable to be cracked and peeled off, by any violence, and will not endure near ſo long as the bodies japanned in the ſame manner, but without any ſuch priming. This may be eaſily obſerved in comparing the wear of the Paris and Bermingham ſnuff-boxes; which latter, when good of their kind, never peel or crack, or ſuffer any damage, unleſs by great violence, and ſuch a continued rubbing, as waſtes away the ſubſtance of the varniſh: while the japan coats of the Pariſian boxes crack and fly off in flakes, whenever any knock or fall, particularly near the edges, expoſes them to be injured. But the Birmingham manufacturers, who originally practiſed the japanning only on metals, to which the reaſon above given for the uſe of priming did not extend, and who took up this art of themſelves as an invention, of courſe omitted at firſt the uſe of any ſuch undercoat; and not finding it more neceſſary in the inſtance of *papier maché*, then on metals, continue ſtill to reject it. On which account the boxes of their manufacture are, with regard to the wear, greatly better than the French. The laying on the colours, varniſh inſtead of gum water, is alſo another variation from the method of japanning formerly practiſed. But the much greater ſtrength of the work, where they are laid on in varniſh or oil, has occaſioned this way to be exploded, with the greateſt reaſon, in all regular manufactures. However, they who may practiſe japanning on cabinets, or other ſuch pieces, as are not expoſed to much wear and violence, for their amuſement only, and conſequently may not find it worth their while to encumber themſelves with the preparations neceſſary for the other methods, may paint with water colours on an undercoat laid on the wood, or other ſubſtance, of which the piece to be japanned is formed; and then finiſh with the proper coats of varniſh, according to the methods below taught. If the colours are tempered with the ſtrongeſt iſinglaſs ſize and honey, inſtead of gum water, and laid on very flat and even, the work will not be much inferior in appearance to that done by the other method; and will laſt as long as the common old japan work, except the beſt kinds of the true japan. It is practiſed likewiſe, in imitation of what is ſometimes done in the Indian work, to paint with water colours on grounds of gold; in which caſe the iſinglaſs ſize, with ſugar-candy or honey, as above directed, is the beſt vehicle. Imitations are alſo made of japan work, by colouring prints, gluing them to wood-work, and then giving them a ſhining appearance, by the uſe of ſome white varniſh.

Of japan grounds.] The proper japan grounds are either ſuch as are formed by the varniſh and colour, where the whole is to remain of one ſimple colour; or by the varniſh either coloured, or without colour, on which ſome painting, or other decoration, is afterwards to be laid. It is neceſſary, however, before I proceed to ſpeak of the particular grounds, to ſhew the manner of laying on the priming or undercoat, where any ſuch is uſed. This priming is of the ſame nature with that called clear coating (or vulgarly clear coaling) practiſed erroneouſly by the houſe painters; and conſiſts only in laying on, and drying in the moſt even manner, a compoſition of ſize and whiting. The common ſize has been generally uſed for this purpoſe: but where the work is of a nicer kind, it is better to employ the glovers or the parchment ſize; and if a third of iſinglaſs be added, it will be ſtill better; and if not laid on too thick, much leſs liable to peel and crack. The work ſhould be prepared for this priming, by being well ſmoothed with the fiſh-ſkin, or glaſs ſhaver; and, being made thoroughly clean, ſhould be bruſhed over once or twice with hot ſize, diluted with two-thirds of water, if it be of the common ſtrength. The priming ſhould then be laid on with a bruſh as even as poſſible; and ſhould be formed of a ſize, whoſe conſiſtence is betwixt the common kind and glue, mixt with as much whiting as will give it a ſufficient body of colour to hide the ſurface of whatever it is laid upon, but not more. If the ſurface be very even, on which the priming is uſed, two coats of it, laid on in this manner, will be ſufficient: but if, on trial with a fine rag wet, it will not receive a proper water poliſh, on account of any inequalities not ſufficiently filled up and covered, two or more coats muſt be given it: and whether a greater or leſs number be uſed, the work ſhould be ſmoothed, after the laſt coat but one is dry, by rubbing it with the Dutch ruſhes. When the laſt coat is dry, the water poliſh ſhould be given, by paſſing over every part of it with a fine rag gently moiſtened, till the whole appear perfectly plain and even. The priming will then be completed, and the work ready to receive the painting, or coloured varniſh: the reſt of the proceedings being the ſame in this caſe, as where no priming is uſed.

Of common grounds of varniſh, which are to be painted upon.] Where wood or leather is to be japanned, and no priming is uſed, the beſt preparation is to lay two or three coats of coarſe varniſh compoſed in the following manner.——“ Take of rectified ſpirit of “ wine one pint, and of coarſe ſeed-lac and reſin “ each two ounces. Diſſolve the ſeed-lac and reſin “ in the ſpirit: and then ſtrain off the varniſh.”—— This varniſh, as well as all others formed of ſpirit of wine, muſt be laid on in a warm place; and, if it can be conveniently managed, the piece of work to be varniſhed ſhould be made warm likewiſe: and for the ſame reaſon, all dampneſs ſhould be avoided; for either cold or moiſture chill this kind of varniſh; and prevent its taking proper hold of the ſubſtance on which it is laid. When the work is ſo prepared, or by the priming with the compoſition of ſize and whiting above deſcribed, the proper japan ground muſt be laid on: which is much the beſt formed of ſhell-lac varniſh, and the colour deſired; if white be not in queſtion, which demands a peculiar treatment, as I ſhall below explain; or great brightneſs be not required, when alſo other means muſt be purſued. The colours uſed with the ſhell-lac varniſh may be, any pigments whatever which give the teint of the ground deſired; and they may be mixt together to form browns or any compound colours: but with reſpect to ſuch as require peculiar methods for the producing them of the firſt degree of brightneſs, I ſhall particularize them below. The colours for grounds may otherwiſe be mixed with the white varniſhes formed in oil of turpentine; but theſe varniſhes have no advantages over the ſhell-lac but in their whiteneſs, that preſerves the brightneſs of the colours; and they are at the ſame time greatly inferior in hardneſs to it. As metals never require to be under coated with whiting, they may be treated in the ſame manner as wood or leather when the undercoat is omitted, except in the inſtances particularly ſpoken of below.

Of white japan grounds.] The forming a ground perfectly white, and of the firſt degree of hardneſs, remains hitherto a deſideratum, or matter ſought for in the art of japanning. As there are no ſubſtances which can be diſſolved, ſo as to form a very hard varniſh, but what have too much colour not to deprave the whiteneſs, when laid on of a due thickneſs over the work, except ſome very late diſcoveries not hitherto brought into practice. The neareſt approach, however, to a perfect white varniſh, by means already known to the public, is made by the following compoſition.—"Take flake white, or white lead, "waſhed over and ground up with a ſixth of its "weight of ſtarch, and then dried; and temper it, "properly for ſpreading, with the maſtic varniſh, "or compound them with the gum animi."—Lay theſe on the body to be japanned, prepared either with or without the undercoat of whiting, in the manner as above ordered: and then varniſh over it with five or ſix coats of the following varniſh.——— "Provide any quantity of the beſt ſeed-lac; and "pick out of it all the cleareſt and whiteſt grains; "reſerving the more coloured and fouler parts for "the coarſer varniſhes, ſuch as that above-mention- "ed for priming or preparing wood or leather. "Take of this pickt ſeed-lac two ounces; and of "gum animi three ounces; and diſſolve them, be- "ing previouſly reduced to a groſs powder, in about "a quart of ſpirit of wine; and ſtrain off the clear "varniſh."———The ſeed-lac will yet give a ſlight tinge to this compoſition; but cannot be omitted, where the varniſh is wanted to be hard: though, where a ſofter will anſwer the end, the proportion may be diminiſhed; and a little crude turpentine added to the gum animi, to take off the brittleneſs. A very good varniſh, free intirely from all brittleneſs, may be formed, by diſſolving as much gum animi, as the oil will take, in old nut or poppy oil; which muſt be made to boil gently, when the gum is put into it. The ground of white colour itſelf may be laid on in this varniſh; and then a coat or two of it may be put over the ground: but it muſt be well diluted with oil of turpentine when it is uſed. This, though free from brittleneſs, is, nevertheleſs, liable to ſuffer, by being indented or bruiſed by any ſlight ſtrokes; and it will not well bear any poliſh, but may be brought to a very ſmooth ſurface without, if it be judiciouſly managed in the laying it on. It is likewiſe ſomewhat tedious in drying, and will require ſome time where ſeveral coats are laid on; as the laſt ought not to contain much oil of turpentine. It muſt be obſerved, likewiſe, that the gum reſin, ſuch as the animi, copal, &c. can never be diſſolved in ſubſtantial oils, by the medium of heat, without a conſiderable change in the colour of the oils, by the degree of heat neceſſary to produce the ſolution. A method of diſſolving gum copal in oil of turpentine is, however, now diſcovered by a gentleman of great abilities in chemiſtry ; and he has alſo obtained a method of diſſolving amber in the ſame menſtruum, ſo that we may hope ſoon to ſee the art of japanning carried to a conſummate degree of perfection ; when the public are put in poſſeſſion of theſe moſt important inventions, or the fruits of them.

Of blue japan grounds.] Blue japan grounds may be formed of bright Pruſſian blue ; or of verditer glazed over by Pruſſian blue ; or of ſmalt. The colour may be beſt mixed with ſhell-lac varniſh ; and brought to a poliſhing ſtate by five or ſix coats of varniſh of ſeed-lac. But the varniſh, nevertheleſs, will ſomewhat injure the colour, by giving to a true blue a caſt of green ; and ſouling in ſome degree a warm blue, by the yellow it contains. Where, therefore, a bright blue is required, and a leſs degree of hardneſs can be diſpenſed with, the method before directed, in the caſe of white grounds, muſt be purſued.

Of red japan grounds.] For a ſcarlet japan ground, vermilion may be uſed. But the vermilion alone has a glaring effect, that renders it much leſs beautiful than the crimſon produced by glazing it over with carmine or fine lake ; or even with roſe pink, which has a very good effect uſed for this purpoſe. For a very bright crimſon, nevertheleſs, inſtead of glazing with carmine, the Indian lake, known in the ſhops by the name of *ſafflower*, ſhould be uſed, diſſolved in the ſpirit of which the varniſh is compounded (which it readily admits of when good.) But in this caſe, inſtead of glazing with the ſhell-lac varniſh, the upper or poliſhing coats need only be uſed ; as they will equally receive and convey the tinge of the Indian lake, which may be actually diſſolved by ſpirit of wine : and this will be found a much cheaper method than the uſing carmine. If, nevertheleſs, the higheſt degree of brightneſs be required, the white varniſhes muſt be uſed. It is at preſent, however, very difficult to obtain this kind of lake. For it does not appear that more than one conſiderable quantity was ever brought over, and put into the hands of colourmen: and this being now expended, they have not the means of a freſh ſupply: it, however, may be eaſily had from the ſame place whence the former quantity was procured, by any perſons who go thither in the Eaſt-India company's ſhips.

Of yellow japan grounds.] For bright yellow grounds, King's yellow, or turpeth mineral, ſhould be employed, either alone or mixed with fine Dutch pink. The effect may be ſtill more heightened, by diſſolving powdered turmeric root in the ſpirit of wine, of which the upper or poliſhing coat is made; which ſpirit of wine muſt be ſtrained from off the dregs, before the ſeed-lac be added to it to form the varniſh. The ſeed-lac varniſh is not equally injurious here, and with greens, as in the caſe of other colours; becauſe, being only tinged with a reddiſh yellow, it is little more than an addition to the force of the colours. Yellow grounds may be likewiſe formed of the Dutch pink only; which, when good, will not be wanting in brightneſs, though extremely cheap.

Of green japan grounds.] Green grounds may be produced by mixing King's yellow and bright Pruſſian blue; or rather, turpeth mineral and Pruſſian blue. A cheap, but fouler kind, may be had from verdigriſe, with a little of the above-mentioned yellows, or Dutch pink. But where a very bright green is wanted, the chryſtals of verdigriſe, (called *diſtilled verdigriſe)* ſhould be employed; and to heighten the effect, they ſhould be laid on a ground of leaf gold, which renders the colour extremely brilliant and pleaſing. They may any of them be uſed ſucceſsfully with good ſeed-lac varniſh, for the reaſon before given: but will be ſtill brighter with the white varniſh.

Of orange-coloured japan grounds.] Orange-coloured japan grounds may be formed, by mixing vermilion, or red lead, with King's yellow, or Dutch pink; or the orange lake; or red orpiment, will make a brighter orange ground than can be produced by any mixture.

Of purple japan grounds.] Purple japan grounds may be produced by the mixture of lake, and Pruſſian blue: or a fouler kind, by vermilion and Pruſſian blue. They may be treated as the reſt, with reſpect to the varniſh.

Of black japan grounds, to be produced without heat.] Black grounds may be formed by either ivory black, or lamp-black: but the former is preferable, where it is perfectly good. Theſe may be always laid on with the ſhell-lac varniſh: and have their upper or poliſhing coats of common ſeed-lac varniſh; as the tinge or foulneſs of the varniſh can be here no injury.

Of common black japan grounds on iron or copper, produced by means of heat] For forming the common black japan grounds by means of heat, the piece of work to be japanned muſt be painted over with drying oil: and when it is of a moderate dryneſs, muſt be put into a ſtove of ſuch degree of heat, as will change the oil black, without burning it ſo, as to deſtroy or weaken its tenacity. The ſtove ſhould not be too hot when the work is put into it, nor the heat increaſed too faſt; either of which errors would make it bliſter: but the ſlower the heat is augmented, and the longer it is continued, provided it be reſtrained within the due degree, the harder will be the coat of japan. This kind of varniſh requires no poliſh, having received, when properly managed, a ſufficient one from the heat.

Of the fine tortoiſe-ſhell japan ground, produced by means of heat.] The beſt kind of tortoiſe ſhell ground produced by heat is not leſs valuable for its great hardneſs, and enduring to be made hotter than boiling water without damage, than for its beautiful appearance. It is to be made by means of a varniſh prepared in the following manner.—" Take of good " linſeed oil one gallon, and of umbre half a pound. " Boil them together till the oil become very brown " and thick: ſtrain it then through a coarſe cloth;

" and ſet it again to boil; in which ſtate it muſt be " continued till it acquire a pitchy conſiſtence, when " it will be fit for uſe."—Having prepared thus the varniſh, clean well the iron or copper plate, or other piece which is to be japanned; and then lay vermilion tempered with ſhell-lac varniſh, or with drying oil diluted with oil of turpentine very thinly, on the places intended to imitate the more tranſparent parts of the tortoiſe-ſhell. When the vermilion is dry, bruſh over the whole with the black varniſh, tempered to a due conſiſtence with oil of turpentine; and when it is ſet and firm, put the work into a ſtove, where it may undergo a very ſtrong heat; and muſt be continued a conſiderable time, if even three weeks or a month, it will be the better. This was given amongſt other recipes by Kunckel; but appears to have been neglected till it was revived with great ſucceſs in the Birmingham manufactures, where it was not only the ground of ſnuff-boxes, dreſſing-boxes, and other ſuch leſſer pieces, but of thoſe beautiful tea-waiters, which have been ſo juſtly eſteemed and admired in ſeveral parts of Europe where they have been ſent. This ground may be decorated with painting and gilding, in the ſame manner as any other varniſhed ſurface, which had beſt be done after the ground has been duly hardened by the hot ſtove: but it is well to give a ſecond annealing with a more gentle heat after it is finiſhed.

Of painting japan work.] Japan work ought properly to be painted with colours in varniſh. But in order for the greater diſpatch, and, in ſome very nice works in ſmall, for the freer uſe of the pencil, the colours are now moſt frequently tempered in oil: which ſhould previouſly have a fourth part of its weight of gum animi diſſolved in it; or, in default of that, of the gums ſanderac or maſtic, as I have likewiſe before intimated. When the oil is thus uſed, it ſhould be well diluted with ſpirit of turpentine, that the colours may be laid more evenly and thin: by which means, fewer of the poliſhing or upper coats of varniſh become neceſſary. In ſome

inſtances,

inſtances, water colours, as I before mentioned, are laid on grounds of gold, in the manner of other paintings; and are beſt, when ſo uſed, in their proper appearance, without any varniſh over them; and they are alſo ſometimes ſo managed, as to have the effect of emboſſed work. The colours employed in this way, for painting, are (as I before intimated) beſt prepared by means of iſinglaſs ſize corrected with honey, or ſugar-candy. The body of which the emboſſed work is raiſed, need not, however, be tinged with the exterior colour; but may be beſt formed of very ſtrong gum water, thickened to a proper conſiſtence by bole ammoniac and whiting in equal parts: which being laid on in the proper figure, and repaired when dry, may be then painted with the proper colours tempered in the iſinglaſs ſize, or in the general manner with ſhell-lac varniſh.

Of varniſhing japan work.] The laſt, and finiſhing part of japanning, lies in the laying on and poliſhing the outer coats of varniſh; which are neceſſary, as well in the pieces that have only one ſimple ground of colour; as with thoſe that are painted. This is in general beſt done with common ſeed-lac varniſh; except in the inſtances, and on thoſe occaſions, where I have already ſhewn other methods to be more expedient: and the ſame reaſons, which decide as to the fitneſs or impropriety of the varniſhes, with reſpect to the colours of the ground, hold equally well with regard to thoſe of the painting. For where brightneſs is the moſt material point, and a tinge of yellow will injure it, ſeed-lac muſt give way to the whiter gums. But where hardneſs, and a greater tenacity, are moſt eſſential, it muſt be adhered to: and where both are ſo neceſſary, that it is proper one ſhould give way to the other, in a certain degree reciprocally, a mixt varniſh muſt be adopted. This mixt varniſh, as I before obſerved, ſhould be made of the pickt ſeed-lac, as directed in p. 47. The common ſeed-lac varniſh, which is the moſt uſeful preparation of the kind hitherto invented, may be thus made.—" Take of ſeed-lac three oun-

“ ces, and put into water to free it from the ſticks
“ and filth that frequently are intermixed with it;
“ and which muſt be done by ſtirring it about, and
“ then pouring off the water and adding freſh quantities,
“ in order to repeat the operations till it be
“ free from all impurities; as it very effectually may
“ be by this means. Dry it then, and powder it
“ groſsly; and put it, with a pint of rectified ſpirit of
“ wine, into a bottle, of which it will not fill above
“ two-thirds. Shake the mixture well together; and
“ place the bottle in a gentle heat, till the ſeed appear
“ to be diſſolved; the ſhaking being in the
“ mean time repeated as often as may be convenient:
“ and then pour off all which can be obtained
“ clear by that method: and ſtrain the remainder
“ through a coarſe cloth. The varniſh thus prepared
“ muſt be kept for uſe in a bottle well ſtopt.”——
When the ſpirit of wine is very ſtrong, it will diſſolve a greater proportion of the ſeed-lac: but this will ſaturate the common, which is ſeldom of a ſtrength ſufficient for making varniſhes in perfection. As the chilling, which is the moſt inconvenient accident attending thoſe of this kind, is prevented, or produced more frequently, according to the ſtrength of the ſpirit, I will take this opportunity of ſhewing a method by which weaker rectified ſpirits may with great eaſe, at any time, be freed from the phlegm, and rendered of the firſt degree of ſtrength.——
“ Take a pint of the common rectified ſpirit of
“ wine; and put it into a bottle, of which it will
“ not fill above three parts. Add to it half an ounce
“ of pearl-aſhes, ſalt of tartar, or any other alkaline
“ ſalt, heated red-hot, and powdered, as well as it
“ can be without much loſs of its heat. Shake the
“ mixture frequently for the ſpace of half an hour;
“ before which time. a great part of the phlegm
“ will be ſeparated from the ſpirit; and will appear,
“ together with the undiſſolved part of the ſalts in
“ the bottom of the bottle. Let the ſpirit then be
“ poured off, or freed from the phlegm and ſalts by
“ means of a *tritorium*, or ſeparating funnel; and

" let half an ounce of the pearl-aſhes, heated and " powdered as before, be added to it, and the ſame " treatment repeated. This may be done a third " time, if the quantity of phlegm ſeparated by the " addition of the pearl-aſhes appear conſiderable. " An ounce of alum reduced to powder and made " hot, but not burnt, muſt then be put into the ſpirit; and ſuffered to remain ſome hours; the bottle " being frequently ſhaken. After which, the ſpirit, " being poured off from it, will be fit for uſe."—— The addition of the alum is neceſſary, to neutralize the remains of the alkaline ſalt or pearl-aſhes; which would otherwiſe greatly deprave the ſpirit with reſpect to varniſhes and laquers, where vegetable colours are concerned; and muſt conſequently render another diſtillation neceſſary. The manner of uſing the ſeed-lac, or white varniſhes, is the ſame; except with regard to the ſubſtance uſed in poliſhing; which, where a pure white, or great clearneſs of other colours, is in queſtion, ſhould be itſelf white: whereas the browner ſorts of poliſhing duſt, as being cheaper, and doing their buſineſs with greater diſpatch, may be uſed in other caſes. The pieces of work to be varniſhed ſhould be placed near a fire, or in a room where there is a ſtove; and made perfectly dry: and then the varniſh may be rubbed over them by the proper bruſhes made for that purpoſe, beginning in the middle, and paſſing the bruſh to one end; and then, with another ſtroke from the middle, paſſing it to the other. But no part ſhould be croſſed or twice paſſed over, in forming one coat, where it can poſſibly be avoided. When one coat is dry, another muſt be laid over it; and this muſt be continued at leaſt five or ſix times, or more; if, on trial, there be not a ſufficient thickneſs of varniſh to bear the poliſh, without laying bare the painting, or the ground colour underneath. When a ſufficient number of coats is thus laid on, the work is fit to be poliſhed: which muſt be done, in common caſes, by rubbing it with a rag dipped in tripoli (commonly called *rotten ſtone)* finely powdered. But towards the end of the rubbing, a little oil of any kind ſhould be uſed along with the powder; and when the work appears ſufficiently bright and gloſſy, it ſhould be well rubbed with the oil alone, to clean it from the powder; and give it a ſtill brighter luſtre. In the caſe of white grounds, inſtead of the tripoli, fine putty or whiting muſt be uſed; both which ſhould be waſhed over, to prevent the danger of damaging the work from any ſand or other gritty matter, that may happen to be commixt with them. It is a great improvement of all kinds of japan work, to harden the varniſh by means of heat; which, in every degree that it can be applied ſhort of what would burn or calcine the matter, tends to give it a more firm and ſtrong texture. Where metals form the body, therefore, a very hot ſtove may be uſed, and the pieces of work may be continued in it a conſiderable time; eſpecially if the heat be gradually increaſed. But where wood is in queſtion, heat muſt be ſparingly uſed; as it would otherwiſe warp or ſhrink the body, ſo as to injure the general figure.

Of gilding japan work.] All the methods of gilding, which are applicable to the ornamenting japan work, having been before taught under the article of gilding, it is needleſs to repeat them here. I ſhall therefore only again obſerve, that in gilding with gold ſize (which is almoſt the only method now practiſed in japan work,) where it is deſired to have the gold not ſhine, or approach in the leaſt towards the burniſhing ſtate, the ſize ſhould be uſed either with oil of turpentine only, or with a very little fat oil. But where a greater luſtre, and appearance of poliſh, are wanting, without the trouble of burniſhing, and the preparation neceſſary for it, fat oil alone, or mixed with a little gold ſize, ſhould be uſed; and the ſame proportionable effect will be produced from a mean proportion of them.

Of laquering.] Laquering is the laying either coloured or tranſparent varniſhes on metals, in order to produce the appearance of a different colour in the metal; or to preſerve it from ruſt and the injuries of the weather. Laquering is therefore much of the ſame nature with japanning, both with regard to the principles and practice; except that no opake colours, but tranſparent tinges alone, are to be employed. The occaſions on which laquering is now in general uſed are three: where braſs is to be made to have the appearance of being gilt: where tin is wanted to have the reſemblance of yellow metals: and where braſs or copper locks, nails, or other ſuch matters, are to be defended from the corroſion of the air or moiſture. There was indeed formerly another very frequent application of laquering; which was colouring frames of pictures, &c. previouſly ſilvered, in order to give them the effect of gilding; but this is now greatly diſuſed. Theſe various intentions of laquering require different compoſitions for the effectuating each kind; and as there is a multiplicity of ingredients which may be conducive to each purpoſe, a proportionable number of recipes have been deviſed, and introduced into practice; eſpecially for the laquering braſs work to imitate gilding; which is a conſiderable object in this kind of art; and has been improved to the greateſt degree of perfection. I ſhall, however, only give one or two recipes for each; as they are all which are neceſſary; the others being either made too complex by ingredients not eſſential to the intention, or too coſtly by the uſe of ſuch as are expenſive; or inferior in goodneſs, from the improper choice or proportion of the component ſubſtances. The principal body or matter of all good laquers uſed at preſent is ſeed-lac; but, for coarſer uſes, reſin, or turpentine, is added; in order to make the laquer cheaper, than if the ſeed-lac which is a much dearer article, be uſed alone. Spirit of wine is alſo conſequently the fluid or menſtruum of which laquers is formed; as the ethereal oils will not diſſolve the ſeed-lac: and it is proper that the ſpirit ſhould be highly rectified for this purpoſe. As it is ſeldom practicable, nevertheleſs, to procure ſuch ſpirits from the ſhops, it will be found very advantageous to uſe the method above given for dephlegmating it by alkaline ſalts; but the uſe of the alum, directed in that proceſs, muſt not be forgotten on this occaſion; as the effect of the alkaline ſalt would otherwiſe be the turning the metal of a purpliſh inſtead of a golden colour, by laying on the laquer. The following are excellent compoſitions for braſs work which is to reſemble gilding.——"Take of turmeric ground, as it may be had at the "dry-ſalters, one ounce, and of ſaffron and Spaniſh "annatto each two drachms. Put them into a proper bottle, with a pint of highly-rectified ſpirit of "wine; and place them in a moderate heat, if convenient, often ſhaking them, for ſeveral days. A "very ſtrong yellow tincture will then be obtained; "which muſt be ſtrained off from the dregs through "a courſe linen cloth: and then, being put back "into the bottle, three ounces of good ſeed-lac powdered groſsly muſt be added, and the mixture placed again in a moderate heat, and ſhaken, till the "ſeed-lac be diſſolved; or at leaſt ſuch part of it as "may. The laquer muſt then be ſtrained as before; "and will be fit for uſe; but muſt be kept in a bottle carefully ſtopt."——Where it is deſired to have the laquer warmer or redder than this compoſition may prove, the proportion of the annatto muſt be increaſed; and where it is wanted cooler, or nearer a true yellow, it muſt be diminiſhed. The above, properly managed, is an extreme good laquer; and of moderate price; but the following, which is cheaper, and may be made where the Spaniſh annatto cannot be procured good, is not greatly inferior to it.—"Take of turmeric root ground one ounce, of the "beſt dragon's blood half a drachm. Put them to "a pint of ſpirit of wine, and proceed as with the "above."——By diminiſhing the proportion of the dragon's blood, the varniſh may be rendered of a redder, or truer yellow caſt. Saffron is ſometimes uſed to form the body of colour in this kind of laquer, inſtead of the turmeric; but though it makes a warmer yellow, yet the dearneſs of it, and the advantage which turmeric has in forming a much ſtronger

er tinge in ſpirit of wine, not only than the ſaffron, but than any other vegetable matter hitherto known, gives it the preference. Though being a true yellow, and conſequently not ſufficiently warm to overcome the greeniſh caſt of braſs, it requires the addition of ſome orange-coloured tinge to make a perfect laquer for this purpoſe. Aloes and gamboge are alſo ſometimes uſed in laquers for braſs: but the aloes is not neceſſary where turmeric or ſaffron are uſed; and the gamboge, though a very ſtrong milky yellow in water, affords only a very weak tinge in ſpirit of wine. The varniſh for tin may be made as follows.—“ Take of turmeric root one ounce, of dra-
“ gon's blood two drachms, and of ſpirit of wine
“ one pint. Proceed as in the former.—This may, like the former, have the red or yellow rendered more prevalent, by the increaſing or diminiſhing the proportion of the dragon's blood. Where a coarſer or cheaper kind is wanted, the quantity of ſeed-lac may be abated; and the deficiency thence ariſing ſupplied by the ſame proportion of reſin. The laquer for locks, nails, &c. where little or no colour is deſired, may either be ſeed-lac varniſh alone, as prepared above, or with a little dragon's blood: or a compound varniſh of equal parts of ſeed-lac and reſin, with or without the dragon's blood. The laquer for picture frames, &c. where the ground is ſilver, and the appearance of gilding is to be produced, may be the compoſition before given, p. 31, for gilding leather: the principle being exactly the ſame in this caſe and that. The manner of laying on the laquer is as follows. Firſt let the pieces of work to be laquered be made thoroughly clean; which, if they be new founded, muſt be done by means of *aquafortis*. Being ready, they muſt be heated by a ſmall charcoal fire in a proper veſſel, or any way that may be moſt convenient: the degree muſt not be greater than will admit of their being taken hold of without burning the hand. The laquer muſt then be laid on by a proper bruſh in the manner of other varniſhes; and the pieces immediately ſet again in the

the ſame warm ſituation. After the laquer is thoroughly dry and firm, the ſame operation muſt be renewed again for four or five times, or till the work appear of the colour and brightneſs intended. For very fine work, ſome uſe a leſs proportion of ſeed-lac; which occaſions the laquer to lie evener on the metal: but, in this caſe, a greater number of coats are required; which multiplies the proportion of labour; though, where the price of the work will allow for ſuch additional trouble, it will be the more perfect for it. The laquering tin may be performed in the ſame manner, as is here directed for braſs: but being for coarſer purpoſes, leſs nicety is obſerved; and fewer coats (or perhaps one only) are made to ſuffice; as the laquer is compounded very red, that the tinge may have the ſtronger effect. Locks, nails, &c. where laquer is only uſed in a defenſive view, to keep them from corroding, and not for the improvement of the colour, may be treated in the ſame manner: but one or two coats are generally thought ſufficient. Though where any regard is had to the wear, the coats of laquer or varniſh ſhould always be of a due thickneſs, when they are to be expoſed to the air; otherwiſe, the firſt moiſt weather makes them chill, and look grey and miſty, in ſuch manner, that they are rather injurious than beneficial to the work they are laid upon. The laquering picture frames, &c. where the ground is leaf ſilver, may be performed in the ſame manner as was before directed in the caſe of gilding leather; the circumſtances being nearly the ſame, except with relation to the texture of the ſubject; to ſuit which the different manner of treatment may be eaſily adapted. But the laquer, as was before obſerved, may be the ſame.

Of ſtaining wood yellow.] Take any white wood; and bruſh it over ſeveral times with the tincture of turmeric root, made by putting an ounce of the turmeric ground to powder to a pint of ſpirit; and, after they have ſtood ſome days, ſtraining off the tincture. If the yellow colour be deſired to have a redder

der caſt, a little dragon's blood muſt be added, in the proportion that will produce the teint required. A cheaper, but leaſt ſtrong and bright yellow, may be given to wood, by rubbing it over ſeveral times with the tincture of the French berries, made boiling hot. After the wood is again dry, it ſhould be bruſhed over with a weak alum-water uſed cold. Leſſer pieces of wood, inſtead of being bruſhed over with them, may be ſoaked in the decoctions or tinctures. Wood may be alſo ſtained yellow by means of *aquafortis*; which will ſometimes produce a very beautiful yellow colour, but at other times a browner. The wood ſhould be warm, when the *aquafortis* is laid on; and be held to the fire immediately afterwards; and care muſt be taken, that either the *aquafortis* be not too ſtrong; or that it be ſparingly uſed; otherwiſe a brown, ſometimes even a blackiſh colour, may be the reſult. In order to render any of theſe ſtains more beautiful and durable, the wood ſhould be bruſhed after it is coloured; and then varniſhed by the ſeed-lac varniſh; or, when deſired to be very ſtrong, and to take a high poliſh, with three or four coats of ſhell-lac varniſh.

Of ſtaining wood red.] For a bright red ſtain for wood, make a ſtrong infuſion of Braſil in ſtale urine, or water impregnated with pearl-aſhes, in the proportion of an ounce to a gallon; to a gallon of either of which, the proportion of Braſil wood muſt be a pound: which being put to them, they muſt ſtand together two or three days, often ſtirring the mixture. With this infuſion ſtrained, and made boiling hot, bruſh over the wood to be ſtained, till it appear ſtrongly coloured: then, while yet wet, bruſh it over with alum-water made in the proportion of two ounces of alum to a quart of water. For a leſs bright red, diſſolve an ounce of dragon's blood in a pint of ſpirit of wine; and bruſh over the wood with the tincture, till the ſtain appear to be as ſtrong as is deſired. But this is, in fact, rather laquering than ſtaining. For a pink or roſe red, add to a gallon of the above infuſion of Braſil wood two additional ounces of the pearl-aſhes, and uſe it as was before directed: but it is neceſſary, in this caſe, to bruſh the wood over often with the alum-water. By increaſing the proportion of pearl-aſhes, the red may be rendered yet paler: but it is proper, when more than this quantity is added, to make the alum-water ſtronger. Theſe reds, when it is neceſſary, may be varniſhed as the yellows.

Of ſtaining wood blue.] Wood may be ſtained blue, by means either of copper or indigo: but the firſt will afford a brighter colour; and is more generally practicable than the latter. Becauſe the indigo can be uſed only in that ſtate to which is is brought by the manner of preparation uſed by the dyers: of whom indeed it muſt be had, as it cannot be properly ſo prepared but in large quantities, and with a particular apparatus. The method of ſtaining blue with the copper is therefore as follows.—"Take a "ſolution of copper, and bruſh it, while hot, ſeve- "ral times over the wood. Then make a ſolution "of pearl-aſhes, in the proportion of two ounces to "a pint of water; and bruſh it hot over the wood, "ſtained with the ſolution of copper, till it be of a "perfectly blue colour."—Wood ſtained green as above by verdigriſe, may likewiſe be made blue, by uſing the ſolution of the pearl-aſhes in the ſame manner. When indigo is uſed for ſtaining wood blue, it muſt be managed thus.—"Take indigo "prepared with ſope-lees as when uſed by the dy- "ers; and bruſh the wood with it boiling hot. "Prepare then a ſolution of white tartar, or cream "of tartar, which is to be made, by boiling three "ounces of the tartar, or cream, in a quart of wa- "ter: and with this ſolution, uſed copiouſly, bruſh "over the wood before the moiſture of the tincture "of indigo be quite dried out of it."—Theſe blues may be ruſhed and varniſhed as the reds, where there is occaſion.

Of ſtaining wood of mohogany colour.] Mohogany colour is the moſt uſeful of any ſtain for wood (eſpecially ſince the fineering with different colours is out of faſhion) as it is much practiſed at preſent for chairs and other furniture made in imitation of mohogany; which, when well managed, may be brought to have a very near reſemblance. This ſtain may be of different hues, as the natural wood varies greatly, being of all the intermediate teints betwixt the red brown, and purple brown, according to the age, or ſometimes the original nature of different pieces. For the light red brown, uſe a decoction of madder, and fuſtic wood, ground in water; the proportion may be half a pound of madder, and a quarter of a pound of fuſtic, to a gallon: or in default of fuſtic, an ounce of the yellow berries may be uſed. This muſt be bruſhed over the wood to be ſtained, while boiling hot, till the due colour be obtained: and, if the wood be kindly grained, it will have greatly the appearance of new mohogany. The ſame effect nearly may be produced by the tincture of dragon's blood, and turmeric root, in ſpirit of wine: by increaſing or diminiſhing the proportion of each of which ingredients, the brown ſtain may be varied to a more red or yellow caſt at pleaſure. This ſucceeds better upon wood, which has already ſome tinge of brown, than upon whiter. For the dark mohogany, take the infuſion of madder made as above, except the exchanging the fuſtic for two ounces of logwood: and when the wood to be ſtained has been ſeveral times bruſhed over, and is again dry, it muſt be ſlightly bruſhed over with water in which pearl-aſhes have been diſſolved, in the proportion of about a quarter of an ounce to a quart. Any ſtains of the intermediate colours may be made, by mixing theſe ingredients, or varying the proportion of them. Where theſe ſtains are uſed for better kind of work, the wood ſhould be afterwards varniſhed with three or four coats of ſeed-lac varniſh; but for coarſe work, the varniſh of reſin and ſeed-lac may be employed, or they may be only well rubbed over with drying oil.

Of ſtaining wood green.] Diſſolve verdigriſe in vinegar, or chryſtals of verdigriſe in water; and, with the hot ſolution, bruſh over the wood till it be duly ſtained. This may be ruſhed and varniſhed as the above.

Of ſtaining wood purple.] Bruſh the wood to be ſtained ſeveral times with a ſtrong decoction of logwood and Braſil, made in the proportion of one pound of the logwood, and a quarter of a pound of the Braſil, to a gallon of water; and boiled for an hour or more. When the wood has been bruſhed over till there be a ſufficient body of colour, let it dry; and then be ſlightly paſſed over by a ſolution of one drachm of pearl-aſhes in a quart of water. This ſolution muſt be carefully uſed, as it will gradually change the colour from a brown red, which it will be originally found to be, to a dark blue purple; and therefore its effect muſt be reſtrained to the due point for producing the colour deſired. This may be varniſhed as the reſt.

Of ſtaining wood black.] Bruſh the wood ſeveral times with the hot decoction of logwood made as above; but without the Braſil. Then having prepared an infuſion of galls, by putting a quarter of a pound of powdered galls to two quarts of water, and ſetting them in the ſun-ſhine, or any other gentle heat, for three or four days, bruſh the wood three or four times over with it: and then paſs over it again, while yet wet, with a ſolution of green vitriol in water, in the proportion of two ounces to a quart. The above is the cheapeſt method: but a very fine black may be produced, by bruſhing the wood ſeveral times over with a ſolution of copper in *aquafortis*; and afterwards with the decoction of logwood, which muſt be repeated till the colour be of a ſufficient force; and the greenneſs, produced by the ſolution of the copper, wholly overcome. Theſe blacks may be varniſhed as the other colours.——— Where the ſtains are deſired to be very ſtrong, as in the caſe of wood intended to be uſed for fineering, it is in general neceſſary, they ſhould be ſoaked, and not bruſhed; to render which the more practicable, the wood may be previouſly ſlit, or ſawed, into pieces of a proper thickneſs for inlaying. It is to be underſtood alſo, that when the wood is above ordered to be bruſhed ſeveral times over with the tinging ſubſtances, it ſhould be ſuffered to dry betwixt each time.

Of ſtaining ivory, bone, or horn, yellow.] Boil them firſt in a ſolution of alum, in the proportion of one pound to two quarts of water: and then prepare a tincture of the French berries, by boiling half a pound of the berries, pounded, in a gallon of water with a quarter of a pound of pearl-aſhes. After this tincture has boiled about an hour, put the ivory, &c. previouſly boiled in the alum water, into it; and let them remain there half an hour. If turmeric root be uſed, inſtead of the French berries, a brighter yellow may be obtained; but the ivory, &c. muſt in that caſe be again dipt in alum water after it is taken out of the tincture; otherwiſe an orange colour, not a yellow, will be produced from the effect of the pearl-aſhes on the turmeric.

Of ſtaining ivory, bone, and horn, green.] They muſt be boiled in a ſolution of verdigriſe in vinegar; or of copper in *aquafortis*, prepared as above directed, (a veſſel of glaſs or earthen ware being employed for this purpoſe,) till they be of the colour deſired.

Of ſtaining ivory, bone, and horn, red.] Take ſtrong lime water, prepared as for other purpoſes; and the raſpings of Braſil wood, in the proportion of half a pound to a gallon. Let them boil for an hour; and then put in the ivory, &c. prepared by boiling in alum water in the manner above directed for the yellow; and continue it there till it be ſufficiently coloured. If it be too crimſon, or verge toward the purple, it may be rendered more ſcarlet, by dipping again in the alum water.

Of ſtaining ivory, bone, and horn, blue.] Stain the ivory, &c. firſt green, according to the manner above directed; and then dip it in a ſolution of pearl-aſhes made ſtrong and boiling hot: but it muſt not be continued longer, nor dipt oftener, than is neceſſary to convert the green to blue. The ivory, &c. may otherwiſe be boiled in the tincture of indigo prepared as by the dyers; and afterwards in the ſolution of tartar made as is directed for the ſtaining wood.

Of ſtaining ivory, bone, and horn, purple.] Treat them in the ſame manner as was directed for red; except that logwood muſt be ſubſtituted in the place of Braſil wood; and the uſe of the alum water muſt be omitted wholly. If a redder purple be wanted, a mixture of the logwood and Braſil muſt be employed, inſtead of the logwood alone. The proportion may be equal parts; or any leſs proportion of the Braſil, according to the colour deſired.

Of ſtaining horn to imitate tortoiſe-ſhell.] The horn to be ſtained muſt be firſt preſſed into proper plates, or ſcales, or other flat form. The following mixture muſt then be prepared.—" Take of quicklime " two parts, and of litharge one; and temper them " to the conſiſtence of a ſoft paſte with ſoap-lye."— Put this paſte over all the parts of the horn, except ſuch as are proper to be left tranſparent, in order to the greater reſemblance of the tortoiſe-ſhell. The horn muſt then remain thus covered with the paſte till it be thoroughly dry: when the paſte being bruſhed off, the horn will be found partly opake, and partly tranſparent, in the manner of tortoiſe-ſhell; and when put over a foil, of the kind of latten called *aſſidue*, will be ſcarcely diſtinguiſhable from it. It requires ſome degree of fancy, and judgment, to diſpoſe of the paſte in ſuch a manner, as to form a variety of tranſparent parts of different magnitude and figure, to look like the effect of nature; and it will be an improvement to add ſemi-tranſparent parts. This may be done by mixing whiting with ſome of the paſte to weaken its operation in particular places: by which ſpots of a reddiſh brown will be produced; that, if properly interſperſed, eſpecially on the edges of the dark parts, will greatly increaſe as well the beauty of the work, as its ſimilitude with the real tortoiſe-ſhell.

To ſtain ivory, bone, and horn, black.] Proceed in the ſame manner as is above directed for wood.

Of ſtaining paper, or parchment, yellow.] Paper may be ſtained yellow by the tincture of French berries; but a much more beautiful colour may be obtained by uſing the tincture of turmeric, formed by infuſing an ounce or more of the root powdered, in a pint of ſpirit of wine. This may be made to give any teint of yellow, from the lighteſt ſtraw to the full colour, called French yellow; and will be equal in brightneſs even to the beſt dyed ſilks. If yellow be wanted of a warmer or redder caſt, annatto, or dragon's blood, muſt be added to the tincture. The beſt manner of uſing theſe, and the following tinctures, is to ſpread them even on the paper or parchment by means of a broad bruſh in the manner of varniſhing.

Of ſtaining paper, or parchment, red.] Paper, or parchment, may be ſtained red, by treating it in the ſame manner as is directed for wood, p. 60; or by red ink. It may alſo be ſtained of a ſcarlet hue by the tincture of dragon's blood in ſpirit of wine: but this will not be bright. A very fine crimſon ſtain may be given to paper, by a tincture of the Indian lake, which may be made, by infuſing the lake ſome days in ſpirit of wine; and then pouring off the tincture from the dregs.

Of ſtaining paper, or parchment, green.] Paper, or parchment, may be ſtained green, by the ſolution of verdigriſe in vinegar; or by the chryſtals of verdigriſe diſſolved in water. As alſo by the ſolution of copper in *aquafortis* made by adding filings of copper gradually to the *aquafortis* till no ebullition enſues: or ſpirit of ſalt may be uſed in the place of the *aquafortis.*

Of ſtaining paper, or parchment, blue.] A blue colour may be given to paper, or parchment, by ſtaining it green by any of the above-mentioned methods; and treating it afterwards as is directed for the ſtaining wood blue, by the ſame means; or by indigo, in the manner there explained likewiſe.

Of ſtaining paper, or parchment, orange.] Stain the paper, or parchment, firſt of a full yellow, by means of the tincture of turmeric, as above directed. Then bruſh it over with a ſolution of fixt alkaline ſalt, made by diſſolving half an ounce of pearl-aſhes, or ſalt of tartar, in a quart of water, and filtering the ſolution.

Of ſtaining paper, or parchment, purple.] Paper, or parchment, may be ſtained purple by archal: or by the tincture of logwood, according to the method above directed for ſtaining wood. The juice of ripe privet berries expreſſed will likewiſe give a purple dye to paper or parchment.

Of ſtaining alabaſter, marble, and other ſtones, of various colours.] Alabaſter, marble, and other ſtones, may be ſtained of a yellow, red, green, blue, purple, black, or any of the compound colours, by the means above given for ſtaining wood. But it is better, when a ſtrong tinge is wanted, to pour the tincture, if made in water, boiling hot on the alabaſter, &c. ſpreading it equally on every part, then to bruſh it over only; though that may be ſufficient where a ſlighter dye will ſuffice. When tinctures in ſpirit of wine are uſed, they muſt not be heated; as the ſpirit would evaporate, and leave the tinging gums in an undiſſolved ſtate. Where ſtones are not perfectly white, but partake of brownneſs or greyneſs, the colour produced by the tinges will be proportionably wanting in brightneſs. Becauſe the natural colour of the ſtone is not hid or covered by theſe tinges; but combines with them: and, for the ſame reaſon, if the ſtone be of any of the pure colours, the reſult will be a compound of ſuch colour and that of the tinge.

Of the method of preparing and colouring marbled paper.] There are ſeveral kinds of marbled paper; but the principal difference of them lies, in the forms in which the colours are laid on the ground: ſome being diſpoſed in whirles or circumvolutions; ſome in waving jagged lengths; and others only in ſpots of a roundiſh or oval figure. The general manner of managing each kind is, nevertheleſs, the ſame: being the dipping the paper in a ſolution of gum tragacanth (or, as it is commonly called, gum dragon);

gon); over which the colours, previouſly prepared, with ox-gall and ſpirit of wine, are firſt ſpread. The peculiar apparatus neceſſary for this purpoſe is, a trough for containing the gum tragacanth and the colours; a comb or quill for diſpoſing them in the figure uſually choſen; and a burniſhing ſtone for poliſhing the paper. The trough may be of any kind of wood: and muſt be ſomewhat larger than the ſheets of paper, for marbling which it is to be employed: but the ſides of it need only riſe about two inches above the bottom: for, by making it thus ſhallow, a leſs quantity of the ſolution of the gum will ſerve to fill it. The comb may be alſo of wood, and five inches in length: but ſhould have braſs teeth, which may be about two inches long, and placed at about a quarter of an inch diſtance from each other. The burniſhing ſtone may be of jaſper, or agate: but as thoſe ſtones are very dear, when of ſufficient largeneſs, marble or glaſs may be uſed, provided their ſurface be poliſhed to a great degree of ſmoothneſs. Theſe implements being prepared. the ſolution of gum tragacanth muſt be made, by putting a ſufficient proportion of the gum, which ſhould be white, and clear from all foulneſſes, into clean water; and letting it remain there a day or two; frequently breaking the lumps and ſtirring it, till the whole ſhall appear diſſolved, and equally mixt with the water. The conſiſtence of the ſolution ſhould be nearly that of ſtrong gum water, uſed in miniature painting: and, if it appear thicker, water muſt be added; or, if thinner, more of the gum. When the ſolution is thus brought to a due ſtate, it muſt be paſſed through a linen cloth, and being then put into the trough, it will be ready to receive the colours. The colours employed for red are carmine, lake, roſe-pink, vermilion, and red lead: but the two laſt are two hard and glaring, unleſs they be mixt with roſe-pink, or lake, to bring them to a ſofter caſt: and with reſpect to the carmine and lake, they are too dear for common purpoſes;—for blue, Pruſſian blue, and verditer, may be uſed:—for yellow, Dutch pink, and yellow oker, may be employed :—for green, verdigriſe, a mixture of Dutch pink and Pruſſian blue, or verditer, in different proportions :—for orange, the orange lake, or a mixture of vermilion, or red lead, with Dutch pink :—for purple, roſe-pink and Pruſſian blue. Theſe ſeveral colours ſhould be ground with ſpirit of wine, till they be of a proper fineneſs; and then at the time of uſing them, a little fiſh-gall, or, in default of it, the gall of a beaſt ſhould be added, by grinding them over again with it. The proper proportion of the gall muſt be found by trying them; for there muſt be juſt ſo much as will ſuffer the ſpots of colour, when ſprinkled on the ſolution of the gum tragacanth, to join together, without intermixing or running into each other. When every thing is thus prepared, the ſolution of the gum tragacanth muſt be poured into the trough; and the colours, being in a ſeparate pot, with a pencil appropriated to each, muſt be ſprinkled on the ſurface of the ſolution, by ſhaking the pencil, charged with its proper colour, over it: and this muſt be done wish the ſeveral kinds of colour deſired, till the ſurface be wholly covered. Where the marbling is propoſed to be in ſpots of a ſimple form, nothing more is neceſſary: but where the whirles or ſnail-ſhell figures are wanted, they muſt be made by means of a gooſe-quill; which muſt be put among the ſpots to turn them about, till the effect be produced. The waving jagged lengths muſt be made by means of the comb above deſcribed, which muſt be paſſed through the colours from one end of the trough to the other; and will give them that appearance. But if they be deſired to be pointed both ways, the comb muſt be again paſſed through the trough in a contrary direction: or if ſome of the whirles or ſnail-ſhell figures be required to be added, they may be yet made by the means before directed. The paper ſhould be previouſly prepared for receiving the colours, by dipping it over night in water; and laying the ſheets on each other with a weight over them, in the caſe of paper to be imprinted by copper plates. The whole being thus ready, the paper muſt be held by two corners, and laid in the moſt gentle and even manner on the ſolution covered with the colours; and there ſoftly preſſed with the hand, that it may bear every where on the ſolution. After which, it muſt be raiſed and taken off with the ſame care; and then hung to dry croſs a proper cord, ſubtended near at hand for that purpoſe: and in that ſtate it muſt continue, till it be perfectly dry. It then remains only to give the paper a proper poliſh; in order to which it is firſt rubbed with a little ſope; and then muſt be thoroughly ſmoothed by the glaſs poliſhers, ſuch as are uſed for linen, and called the calender glaſſes. After which it ſhould be again rubbed by a burniſher of jaſper or agate; or, in default of them, of glaſs ground to the higheſt poliſh: for on the perfect poliſh of the paper depends in a great degree its beauty and value. Gold or ſilver powders may be uſed, where deſired, along with the colours; and require only the ſame treatment as them: except that they muſt be firſt tempered with gum water.

The original recipe for the making Pruſſian blue, as publiſhed by Dr. Woodward.] "Take any quantity "of blood; and evaporate it to dryneſs; conti"nuing the heat till it become black; but avoiding "the burning any part of it to aſhes. Powder the "dry matter; and mix it thoroughly with an equal "weight of pearl-aſhes; and calcine the mixture in "an iron pot or crucible, on which a cover is put. "The calcination muſt be continued ſo long as the "matter emits any flame; the fire being raiſed to a "conſiderable degree of heat at the end of the ope"ration; and the matter muſt be then powdered; "and put, while yet hot, into twelve times its "weight of water; which muſt be again ſet on the "fire to boil for the ſpace of three quarters of an "hour, or more. The fluid muſt then be filtered "off through a thin flannel bag, from the part re"maining undiſſolved: through which remaining "part freſh water ſhould be paſſed, before it be ta-

“ ken out of the filtering bag, to extract as much as
“ poſſible of the ſolution: and the water thus paſſed
“ through ſhould be added to the quantity before
“ filtered: after which, what is retained in the bag
“ may be thrown away. In the mean time a ſoluti-
“ on ſhould be made of alum, and copperas calcin-
“ ed to whiteneſs, in the proportion of two pounds
“ of the alum, and two ounces of the calcined vi-
“ triol, to each pound of the pearl-aſhes uſed with
“ the blood: which ſolution muſt be made by boil-
“ ing the alum and copperas in five times their
“ weight of water, and then filtering them through
“ flannel or paper, where great nicety is required.
“ When the ſolution of the alum and copperas is
“ thus prepared; it muſt be added to the lixivium
“ filtered off from the calcined blood and pearl-aſh-
“ es; from which mixture, the precipitation of a
“ blackiſh green matter will ſoon enſue. After the
“ precipitated matter has ſubſided to the bottom of
“ the veſſel, and the fluid appears clear over it, ſepa-
“ rate it from the green ſediment, firſt by pouring off
“ all that will run clear out of the veſſel, and after-
“ wards by ſtraining off the remainder; and then
“ put the green matter again into a veſſel, that will
“ contain as much fluid as it was before mixt with.
“ Add ſpirit of ſalt to it afterwards, in the propor-
“ tion of ſix ounces to every pound of the pearl-
“ aſhes nſed; and the green matter will then ſoon
“ appear to be converted into a beautiful blue.
“ Water muſt then be added, to waſh off the ſpirit
“ of ſalt; which muſt be renewed ſeveral times, till
“ it come off perfectly ſweet; and the laſt quantity
“ muſt then be ſtrained off; and the blue ſediment
“ dried in lumps of a moderate ſize. The produce
“ will be about three ounces for every pound of the
“ pearl-aſhes employed.”——If the produce be deſired to be made either of a lighter or darker hue, it may be done by increaſing the proportion of the pearl-aſhes, to the blood, to give a lighter kind; or the ſpirit of ſalt to the pearl-aſhes, to give a deeper kind: but the quantity will in the latter caſe

caſe be proportionably diminiſhed. The ſtraining or filtering the lixivium through flannel is not ſo good a method as the doing it through paper; eſpecially where the colour is wanted of a very great brightneſs and purity: and the water is beſt ſeparated from the great ſediment firſt produced, and afterwards from the blue one, by the ſame means: but in theſe caſes a fine linen cloth much worn, though whole, ſhould be laid over the paper. The colour, when reduced to a proper conſiſtence, may be laid on chalk ſtones to dry: and a moderate heat may be alſo uſed for greater expedition, when required; but great care ſhould be taken not to burn the matter. The calcination may be performed in a reverberatory furnace, ſuch as is uſed by the chemiſts; or in the furnaces where metals are melted; for the crucible or pot, containing the matter, may either be ſurrounded by the coals, or placed over them, provided a ſufficient heat be given to it. But where larger quantities are to be calcined, they may be very cheaply and commodiouſly managed in the potters or the tobaccopipe-makers furnaces; being put into them along with the earthen ware and pipes. And if the calcined matter in ſuch caſe cannot be conveniently powdered while hot, and put into the water, the deviating from that part of the proceſs may be diſpenſed with; not being abſolutely neceſſary, if the matter be well powdered afterwards before it be put into the water.

End of the FIRST PART.

20 SEP 70

THE

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30 SEP 70

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THE

SCHOOL of ARTS.

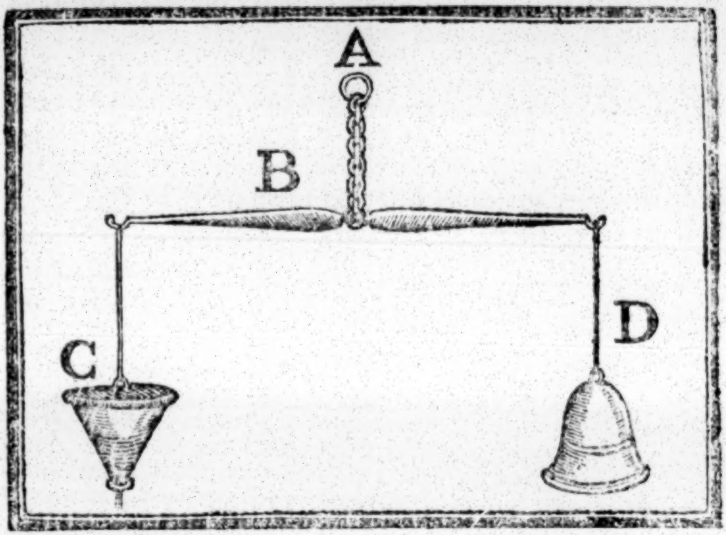
The Engliſh Fifty Pounds Premium Receipt for either taking or deſtroying Rats, or Mice, without Poiſon.

THERE is no better place of ſecurity to decoy theſe vermin into than a large round wire cage, made in form of the common mouſe-traps, about ſixteen inches wide, with ſeveral places for entrance: thoſe for receiving mice ſhould be much ſmaller, and ſo ſhould the holes they enter at. It will be neceſſary, firſt, to obſerve the places they moſt frequent, and to diſcover the holes they make for paſſing and repaſſing. The traps are to be ſet within four or five yards of theſe holes, and from which, quite to thoſe traps, the floor is to be rubbed (in a ſtrait line about four inches wide) with a piece of ſtrong Cheſhire cheeſe toaſted, on which a few drops of oil of anniſeed has been dropped, and the trap ſhould be well rubbed likewiſe. *Baits for the traps are to be made thus:* Of ſtrong cheeſe eight ounces; oatmeal the like quantity; ſeven or eight drops of oil of anniſeed; Indian berries one ounce; featherſew half an ounce; droppings of ſweet-oil ſufficient to make it up into a paſte: then form it into many little balls, and this will moſt aſſuredly decoy them into the cage, though many people were preſent. I adviſe the uſe of traps, otherwiſe they would retire to their private haunts, and expire, which would prove very offenſive for ſome time to all near them, eſpecially in warm weather.

The following is likewiſe by a Candidate for the Fifty Pounds Premium.] Procure an earthen veſſel, well glazed in the inſide, near two feet high, and full one broad, fill it to the middle with water, and hang a very ſmooth board at the top by two ſtrong pins, and ſo even that the leaſt weight will trip it up on either ſide; this board is to be well daubed over with the greaſy compoſition mentioned in page 3, (only he leaves out the featherſew) which entices the vermin on the board, and that ſlides them into the water, from whence there is no eſcaping.

Diſcovery of the true reaſon of burning ſulphur in hogſheads, for preſerving wine, by a new and curious experiment.] If two or three drops of the oil of tartar are poured into half a glaſs of very fine red wine, the wine will loſe its red colour, and become opaque and yellowiſh, as turned and pricked wine; but if two or three drops of the ſpirit of ſulphur, which is a very ſtrong acid, are afterwards poured into the glaſs, the ſame wine will intirely reſume its beautiful red colour; whence the reaſon is eaſily perceived, why ſulphur is burnt in hogſheads in order to preſerve wine, ſince it is not the inflammable part of ſulphur that cauſes this effect, but its acid ſpirit, that enters and permeates the wood of the veſſel.

The uſeful Alarm-Bell.] This is originally a Dutch invention, and by which a perſon may be enabled to riſe at any time of the night; or know how time goes as well as by a clock, or watch, by obſerving the following directions.



A is a ſmall chain in the middle of a beam, and by which it hangs. B is a kind of beam, like thoſe belonging to ſcales. C a veſſel made of either glaſs or tin, in the form deſcribed, which is to be filled with fine dry ſand, the quantity to be more or leſs, according to the time you would riſe: the veſſel C is to have a ſmall hole at the bottom, as in an hour-glaſs, through which the ſand is to paſs. D is a bell at the oppoſite end of the beam B. When the veſſel C is empty, the bell D is to be a very little heavier than C, by which means, after the ſand is all diſcharged, the bell D becoming more weighty than C, the ballance inſtantly falls on that ſide, and the bell continues ringing for ſome time, and by which noiſe the perſon is called at the time required. The way to proportion the ſand to the time is thus: Suppoſe a perſon required to be called in four hours after going to reſt: If, on trial, half a pound of ſand will run four hours, then that is to be the quantity; if in ſix hours, then twelve ounces are to be put into the veſſel; if in eight hours, one pound, and ſo in proportion to the time it is to run.

The manner of ſilvering Looking-glaſſes, as done in London and Birmingham.] Firſt ſpread a paper on an

even

even board or ſtone (a ſtone is beſt) on that ſprinkle a little fine chalk, over which lay the leaf of tin: then dip a piece of cotton in quickſilver, and rub gently over the tin-leaf (where the glaſs is to cover) till it looks bright. You are now to pour on the quickſilver as long as it will lie. Lay ſlips of paper, three double, on each ſide, to ſupport the glaſs, and then gently move it forward, keeping your hand preſſing on it, to force out the ſuperfluous quickſilver; let it be removed to another flat board, or ſtone, or lay a weight on it on the ſame, and in a day or two it will be dry. Note, for large plate glaſſes, a ſcrew anſwers much better than a weight laid on.

The ſurpriſing effects of ſuccinum, or yellow Amber.] Succinum, after it is diſſolved, is ſaid to be infallible in curing the gout, and all aches, or pains, from whatſoever cauſe they proceed. It likewiſe aſſuredly cures that moſt torturing pain called the cramp; and inflamed or ſore eyes, by only being worn as a necklace, about the neck, without being diſſolved, as many thouſands have experienced, and found the effects of, who had been troubled with ſore eyes, and tried ſeveral other means, without receiving the leaſt benefit. While I am ſpeaking of Succinum, it may not be improper to inſert the account given of it by the great Bartholinus, as taken from the acts of Copenhagen. " I ſhall now relate, ſays he, the experiments I made on the nature and effects of Succinum. 1. A perſon that worked in lacquered ware taught me, as a great ſecret, a method for diſſolving Succinum, which was to burn and reduce to aſhes the blood and ſkin of a hare in a new veſſel. The hot lixivium of theſe aſhes diſſolves, he ſays, the ſuccinum thrown into it. Galen (in his book of the diſorders of the reins) ſays, that the lixivium of the aſhes of hare's ſkin is a good ſtone diſſolvent. William Lauremberg, and Jerom Sachs, recommend the aſhes of a hare in the gout. The virtue of theſe aſhes depends chiefly on the fixed alkali ſalt contained in them. 2. The ſpirit of wine, well dephlegmated, produces the ſame effect. 3. Francis Joel, in the third ſection of his Surgery, page 196, preſcribes a method for diſſolving ſuccinum with maſtic, colophonia, turpentine and wax; and for making a ſarcotic plaiſter of it. Valerius Cordus makes it the baſis of his aromatic pills and trochies, of which the preſcription is found in his diſpenſary. Crato's pills of ſuccinum, corrected by Renaldus, are preferable to thoſe of Cordus, and I know their virtues from my own experience. 4. A like diſſolution of lacca is found in Cordus's diſpenſary. 5. Some bodies, harder than ſuccinum, are alſo diſſolved and ſoftened by different manipulations, which though made ſecrets of, I ſhall here take a pleaſure in publiſhing.

For ſoftening Chryſtal.] It muſt be left ſome time in the milk of a goat which has been made to feed during forty-ſix days on ivy leaves. The uſe of this milk has been proved to be of ſingular ſervice to thoſe troubled with the gravel.

For ſoftening Ivory and Bones.] Take ſage, boil it in ſtrong vinegar, ſtrain the decoction through a piece of cloſe cloth; and, when you have a mind to ſoften bones or ivory ſteep them in this liquor, and the longer they remain in it, the ſofter they will grow.

For ſoftening glaſs.] Take the blood of a he goat and a duck, ſome dregs of oil and vinegar; mix theſe things together, and put them into a varniſhed earthen pot; let the whole be warmed a little, and afterwards, having put ſome glaſs in, let it there remain, till it becomes ſoft.

Another preparation for ſoftening bones.] Take roman-vitriol and common ſalt, of each one pound; bruiſe and reduce them into an impalpable powder; put them into an alembic: the diſtilled water will have the virtue of ſoftening bones; and, to ſucceed therein, this need only be left to ſteep in it for half a day.

A ready way for melting iron.] Take ſulphur, mix it with a little ſalt, and dilute the mixture with a child's urine, till it becomes white: beſmear the iron with it, and you will ſoon ſee it liquefy. As to the more compact and harder metals, fire alone can make them liquefy.

The virtues of Succinum.] Taken inwardly is good againſt cataracs, and pains and aches of the head; but, that it is attended with as ſalutary effects, when applied externally, is what experience has not yet convinced all perſons of. Mizaldus ſays, that faſtened about the neck, it radically and ſurpriſingly cures the fiſtula lachrimalis and ſoreneſs of the eyes. A woman of Copenhagen, being tormented with a continual pain of the head, was adviſed to wear an amber necklace, whereupon the pain ſoon vaniſhed. This induced her to leave it off but ſeldom, and only when ſhe was apprehenſive it cauſed too great a drineſs, by diſſipating too great a quantity of her humours. This obſervation is ſupported by that of Caſpard Scholler, a magiſtrate of the ſame city, who is laviſh of his commendations of ſuccinum, having himſelf found very good effects by it.

A remarkable circumſtance concerning ale; with an unerring method of brewing malt liquor, that will ſoon be fine and fit for drinking; and far more palatable and wholeſome than what is procured from the too common, erroneous way many brewers follow.] Whoever brews, and expects to have either good ale, or beer, will be ſure to be diſappointed, if care is not taken to provide good malt and hops; nor is the water made uſe of ſo very immaterial an article as ſome imagine, for a great deal depends upon it. What I have above advanced, may very likely be credited by many; but when I come to tell them, there is more malt liquor ſpoiled by high boiling, than by all miſmanagements put together, it is eaſy to perceive I ſhall have many obſtinate infatuated people to encounter with, who very ſimply imagine, that ale or beer, cannot poſſibly be bad which has had a four hours boiling. It is well known there are many parts of England remarkable for fine malt liquors; and I as well know, that not one of the counties that have excelled in either ale, or beer, ever boiled above half an hour at moſt. There is, indeed, a town in Devonſhire, that is ſaid to have conſtantly good ale. I am well acquainted with it; Barnſtable, no doubt, has a ſtrong glutinous ale, that pleaſes many people; and thoſe who brew, I dare ſay, moſt ſcandalouſly boil it, at leaſt four hours. But what is the conſequence? Why there is ſcarce a houſe in the place but affords a pair or two of crutches, and unhappy cripples to make uſe of them. I muſt own people in England have not followed this pernicious cuſtom ſo much of late years. They find they are gainers by their reformation; and many have owned, they never had ſuch valuable ale, or beer, as ſince they left off the old miſtaken way of boiling for three or four hours, and acknowledge they have reduced it to leſs than a quarter of that time. There are others again, who declare, to their cuſtomers, that they actually boil four hours; when, in fact, a quarter of an hour is the moſt they have boiled for five or ſix years paſt. I believe this reformation is chiefly owing to ſome treatiſes publiſhed concerning brewing, in which the pernicious conſequence of high boiling is ſufficiently diſplayed and exploded. I will beg leave to give an inſtance of the bad conſequences of long boiling, that will be ſufficient to ſatisfy any perſon, who practiſes it, of their error. A gentleman of my acquaintance, in Cheſter, often complained to me, that he bought the beſt of malt and hops; that they had fine water from the river Dee, and he had it conſtantly boiled full four hours; and yet notwithſtanding all this, he could not have either good ale, or beer. His lady too joined in the complaint, and ſaid, it would be a great ſatisfaction if a remedy could be found, as many of the gentlemen who viſited there preferred a glaſs of fine beer to any liquor whatever. I then told him, if he would have a brewing after my direction, I would be anſwerable, that it would prove ſatisfactory. Accordingly good malt and hops were provided, and the water was fetched from

the

the river Dee, as uſual. I muſt own it was with the utmoſt difficulty I prevailed on the man who brewed to boil it ſo ſhort a time, who ſwore it would be good for nothing. However, I at length prevailed, and he proceeded in the following manner. The quantity of liquor was ſixty gallons; and, to put the thing quite out of diſpute, and to prove that boiling long was erroneous, the firſt twenty gallons were boiled twenty-ſix minutes; the ſecond twenty gallons one hour and a quarter; and the third and laſt twenty gallons full two hours. In about a month, the three caſks were examined: that which was boiled twenty-ſix minutes, proved extremely fine and well taſted, and gave a general ſatisfaction. But the caſk which contained the liquor of the ſecond boiling, was very far from being either ſo fine or pleaſant. And the third caſk, which contained the laſt and long boiled liquor, proved very foul, and quite diſagreeable in many other reſpects. Now as there was no difference in the management of the ſixty gallons of ale I have been ſpeaking of, boiling only excepted, how will the advocates for long boiling malt-liquors account for this? The ſame malt, hops and water, tunned at the ſame time, and in caſks of the ſame ſize, and placed in the ſame good cellar. I have to add to this account, that at the two months end, the ſecond boiling was foul and ill taſted, and was made fine with great difficulty. The laſt boiling was very foul and bad; at the end of ſix months it was cloudy, ropy, and ill taſted; ſome attempts were made, in vain, to fine it; but at about ten months old, it was far worſe. The gentleman, who, indeed, was too fond of long boiling, for many years before, as it had been often inſinuated to him, that drink could not be boiled too much, was greatly pleaſed to find the firſt caſk prove ſo exceeding good, with little boiling; he then gave orders to the man who brewed for him, never for the future, to boil his liquor above twenty minutes, which directions were ſtrictly obſerved; and it is now as uncommon to find any malt-liquor that is bad in his cellars, as it was before to have any that was good. Much about the time this experiment was making, a little book was advertiſed, by one Chapman, at two ſhillings price; it contains only thirty-ſix pages, and is the beſt help towards a reformation in brewing I ever met with. His arguments are truly ſenſible; and it is much to be lamented, ſo excellent a tract ſhould remain in obſcurity on the ſeeming high price it bears. Chapman, in this ſmall tract, gives ſuch undeniable, ſuch convincing proofs, of the abſurdity of boiling either ale, or beer, longer than fifteen minutes, as at once muſt convince any ſenſible perſon, that long boiling waſtes both fire and liquor, and to no other end than to render ſuch drink unwholeſome and diſagreeable. But I would fain know what it is boiled for the length of four hours? Some tell you, 'tis to get the goodneſs out of the hops. To which I anſwer, it is a ſad thing ſo many thouſand gallons of malt-liquor ſhould be ſpoiled every year, only to get goodneſs (as they are pleaſed to call it) out of the hop, when many other means might be uſed to do it in a few minutes. In one word, the long boiling malt-liquor has many bad properties attending it, without having any thing in its favour: for it renders ſuch ale too gummy and ſizy to be wholeſome, and is the cauſe of many becoming cripples, who make a too frequent uſe of thoſe pernicious long boiled liquors: for the blood, by this means, becomes too glutinous to paſs the fine blood veſſels: hence ariſe thoſe various diſorders! thoſe pains! thoſe aches! that render the unhappy cripples not only a fatigue to themſelves, but introduce diſorders that are felt by future generations. Nor does the miſchief ſtop here (though I muſt own this is the moſt melancholy part of it) for whenever ſuch ale, or beer, proves foul, which is too commonly the caſe, it is with great difficulty made fine, and fit for drinking. In ſhort, thoſe who once experience the great advantage that will reſult from boiling their liquor according to the directions of Chapman (or at moſt not to exceed twenty-five or thirty minutes) will be ſure to have this ſatisfaction; that their ale will be much better, pleaſanter, and more wholeſome, than thoſe that are long boiled; by which they will not only preſerve the health of thoſe who drink it, but alſo have more liquor from the ſame quantity of malt; which very likely may be a means of prevailing, as intereſt is in the caſe, more than any other arguments. It is to be remarked that all liquor ſhould be boiled as nimbly as poſſible (ſo as not to make it run out of the boiler) and alſo that the long ſtupid way of boiling for the goodneſs of the hop, is of the utmoſt prejudice; for its fine flavour will be ſoon extracted: what comes after, by length of ſtewing, is only an earthy, heavy, pernicious quality, that will be ſure to render the ale diſagreeable, and prove prejudicial to thoſe who drink it. Thus much I have preſumed to ſay, in order to prevent the pernicious cuſtom, that has too long prevailed: perſons of reaſon will very likely try the experiment: 'tis on thoſe I rely, and on whom it will chiefly depend to decide, which method is beſt to purſue, that guided by reaſon, long experience, and the reſult of many years practice; or the method obſtinately purſued by unreaſonable bigots, and a ſet of infatuated old women.

The benefits ariſing from drinking Tar-Water.] Tar-water has been lately recommended to the world as a certain, ſafe, and almoſt infallible medicine in almoſt all diſeaſes: a ſlow, yet effectual alterative in cachexies, ſcurvies, chlorotic, hyſterical, hypochondrical, and other chronical complaints: and a ſudden remedy in acute diſtempers which demand immediate relief, as pleuriſies, peripneumonies, the ſmall-pox, and all kind of fevers in general; yet, though it may fall ſhort, in ſome caſes, of the character given it; it is, doubtleſs, in a multitude of caſes, of great utility: it ſenſibly raiſes the pulſe, and occaſions ſome conſiderable evacuations, generally by perſpiration, or urine, though ſometimes by ſtool, or vomit: hence it is ſuppoſed to act by increaſing the vis vitæ, and enabling nature to expel

pel the morbific humours. We ſhall here inſert, from the firſt publick recommender of this liquor (Biſhop Berkely) ſome obſervations on the manner of uſing it. Tar-water, when right, is not paler than French, nor deeper coloured than Spaniſh white wine, and full as clear: if there be not a ſpirit very ſenſibly perceived in drinking, you may conclude the tar-water is not good. It may be drank either cold or warm; in cholicks, I take it to be beſt warm. As to the quantity in common chronical diſpoſitions, a pint a day may be ſufficient, taken on an empty ſtomach, at two, or four times, to wit, night and morning, and about two hours after dinner and breakfaſt: more may be taken by ſtrong ſtomachs. But thoſe who labour under great and inveterate maladies, muſt drink a greater quantity; at leaſt a quart every twenty-four hours: all of this claſs muſt have much patience and perſeverance in the uſe of this, as well as of all other medicines, which, tho' ſure, muſt yet, in the nature of things, be ſlow in the cure of inveterate chronical diſorders. In acute caſes, fevers of all kinds, it muſt be drank in bed warm, and in great quantity (the fever ſtill enabling the patient to drink) perhaps a pint every hour, which I have known to work ſurpriſing cures. But it works ſo quick and gives ſuch ſpirits, that the patients often think themſelves cured, before the fever hath quite left them.

Biſhop BERKLEY'*s manner of preparing Tar-Water.*] Tar, two pounds; water, one gallon. Stir them ſtrongly together with a wooden rod: and after ſtanding to ſettle for two days, pour off the water for uſe. It muſt be acknowledged the tar-water, prepared after the directions here given, has done great ſervice in a multitude of diſorders, after many other medicines had been tried, to very little purpoſe: particularly in the ſmall-pox, fevers, ſcurvy, &c. though of the moſt inveterate kind: againſt which laſt diſorder the following are likewiſe ſaid to act very powerfully, viz. Horſe-radiſh, ſcurvy-graſs, muſtard-ſeed, buck-bean, water-dock; ſcorbutic ale, ſcorbutic wine, Muntingius's ſcorbutic wine, ſtomachic elixir, elixir of vitriol, ſcorbutic juices, ſcorbutic whey, paralitic infuſion, acid elixir proprietatis, chalibeat electary, and other preparations of iron, Peruvian bark, bitter infuſion, ſimple and purging ſal polichreſt, acid electary, decoction of tamarinds, bitter tincture of rhubarb, tinctura ſacra, ſtomachic pills.

How to take off ſuperfluous hair.] This is often advertiſed in the news papers, and is ſold at ſo high a price, that a perſon has acquired a fortune by the ſale of it; the preparation is both eaſy and cheap, being only quick lime and orpiment, made into a paſte with common river water; but thoſe who uſe this compoſition, ought to be cautious how they put it on the part, and not ſuffer it to remain above a minute or two.

To make Vinegar of Beer.] Boil a quart of ſharp beer-vinegar about eight minutes; take off the ſcum, and put therein two ounces of bay-ſalt, four of cream of tartar, and two of allum; then put it to twenty gallons of beer, and let it ſtand in the hot ſun as the cider is directed.

To turn acid Cider into Vinegar.] Cream of tartar half a pound, boil it in a quart of ſtrong white wine vinegar, and put it hot into twenty gallons of cider, which you are to ſet in the ſun a few days, and it will be excellent vinegar. The bung muſt be off.

The celebrated Bath Liquid for taking out Spots, Stains, &c.] Put half a pound of ſoap-boiler's aſhes into three pints of river water; let it ſtand four days (often ſtirring it) then pour off the clear water, and mix it, as you uſe it, with fuller's-earth, in which a few drops of ſpirits of turpentine have been mixed: this you are to lay hot on the place, and it will ſurely take out either ſpot or ſtain.

To clean Jewels, Pearl, &c.] There is nothing cleans any kind of jewels like fine ſmalt and emery mixed together. Rub them well with a fine ſoft bruſh dipped in the powder. Pearls are to be waſhed with a ſtrong lee of burnt tartar.

To boil up Plate, to look like new.] Of unſlacked lime and allum one pound each; beer grounds two quarts: boil the plate in theſe about a quarter of an hour.

A ſafe and ſure Cure for an Intermitting Fever.] Drink plentifully of warm lemonade in the beginning of every fit, and in a few days the fever will ceaſe. Or, take twenty grains of ſal ammoniac in a diſh of tea, an hour or two before the fit comes on.

How to prevent the ſmoaking of Lamp-Oil.] Soak your match, or cotton, in vinegar, and dry it well before you uſe it; it will then burn both ſweet and pleaſant, and give abundance of ſatisfaction for the trifling trouble you have in preparing it.

How to make Homberg's Black Phoſphorus, which takes fire immediately on being expoſed to the open air.] This article, which may be made uſeful on ſundry occaſions, either at home or abroad, is prepared with allum and wheat flour (five parts of the former to one of the latter) calcined together to a browniſh, or black maſs; which being powdered and ſet in a phial looſely ſtopped, in a ſand heat, ſo as to continue glowing for ſome time; then removing the whole from the fire, and ſuffering it to cool gradually, and at laſt ſtopping the bottle cloſe, it ſhould be kept in a dark and dry place. A little of this powder being expoſed to the open air, it at once takes fire, and appears like a glowing coal: and it is remarkable, that it may be made of any animal or vegetable ſubſtance, inſtead of wheat flour; but that no ſalt can be ſubſtituted inſtead of alum. This is very neceſſary in a family, as it conſtantly affords light on any occaſion, day or night, when a tinder-box is not to be had.

Another Phoſphorus, by Mr. Homberg.] This is made of one part of ſal ammoniac, and two parts of lime, ſlacked in the air; mix theſe well together, and fill a ſmall crucible with them: ſet this in a ſmall fire of fuſion, and as ſoon as the crucible is red hot, the mixture will melt, and ſhould be ſtirred with an iron-rod to prevent its running over. When the matter is entirely fuſed, pour it into a braſs mortar, and, when cold, it will appear of a grey colour, and as if vitrified; if now it be ſtruck upon with any hard body, it appears as on fire in the whole extent of the ſtroke; but the matter being brittle, it is proper, for the experiment's ſake, to dip little bars of iron, or copper, into the melted matter in the crucible, for thus they will be enamelled as it were with the matter, and theſe bars being ſtruck upon, will give the ſame fire, and the experiment may be ſeveral times repeated before all the matter falls off. Theſe bars muſt be kept in a dry place, to prevent the phoſphorus upon them from running, by the moiſture of the air. Both theſe phoſphori were diſcovered by accident; the firſt, in ſearching for a limpid oil from the common ſtercoracious matter that ſhould fix quickſilver; and the ſecond, by endeavouring to calcine ſal ammoniac with lime, ſo as to render it fuſible like wax; which end was obtained, but not the other.

Phoſphorus, in phyſiology, is a denomination given to all bodies which ſhine, and ſeem to burn, without having any degree of heat: and that theſe bodies owe their lucidity to the motion of the parts, ſeems evident for the following reaſons. 1. Several phoſphori are undoubtedly owing to putrefaction, as rotten wood, very ſtale meat, eſpecially veal, ſome ſorts of fiſh long kept, as Oyſters, Lobſters, Flounders, Whitings, &c. which putrefaction is the effect of a ſlow and gentle fermentation, or inteſtine motion of the parts. 2. Moſt Phoſphori have their light ſo weak as to ſhine only in the dark, which ſeems to argue a leſſer degree of velocity in the parts than what is neceſſary to produce heat; becauſe this laſt degree of velocity will cauſe bodies to ſhine in open day-light. 3. Some Phoſphori are the parts of animated bodies, as the cicindela or glow-worm; but all the parts of an animal are undoubtedly in motion. 4 Other Phoſphori put on the appearance of flame, as the ignis fatuus, the writing of common Phoſphorus made from urine, flaſhes of lightning, &c. but all flame is nothing but a kindled vapour, whoſe parts are all in motion, which may be too weak to cauſe burning, or even a ſenſible degree of heat. 5. Several of thoſe innocent lambent flames may have their matter ſo agitated, or the velocity of their motion ſo increaſed, as actually to produce heat, and burn: thus, the writing of Phoſphorus on blue paper, ſufficiently rubbed, will kindle into an ardent flame, and burn the paper. 6. Phoſphori ſeem to have the eſſential nature of fire, becauſe they are ſo eaſily ſuſceptible of a burning quality from fire: thus, common Phoſphorus is immediately kindled into a moſt ardent and inextinguiſhable flame, by common fire. 7. By ſtroking the back of a black horſe, or cat, in the dark, we produce innumerable ſcintillæ, or lucid ſparks; in the ſame manner, the rubbing a piece of black cloth, which has hung in the ſun to dry, will cauſe it to throw out the particles of light which it had imbibed from the ſun; whereas, a white piece of cloth, which reflects moſt of the ſun's rays, emits no ſuch lucid ſparks in the dark. Many other reaſons might be urged to ſhew, that light of every kind is owing to one and the ſame cauſe in a greater or leſſer degree, viz. the velocity of the parts of the lucid body. Phoſphori in general, ſays Lemeri, may be conſidered as ſo many ſpunges full of the matter of light, which is ſo ſlightly retained therein, that a ſmall external force is ſufficient to put it in motion, and cauſe it to exhale in a lucid form. Thus the Phoſphori made of human urine, and other chemical preparations, receive ſo large a proportion of fire in their preparation, and retain it ſo well in their unctuous ſubſtance, that it may be kept there, in water, for twenty years; ſo as upon the firſt laying them open to the air, they ſhall take fire, and exhale in lucid flames. Not that the fire is ſuppoſed to be fixed and quieſcent all the while in the body of the Phoſphorus; for that it has a real motion all the time is evident hence, that it is ſeen in any dark place, in the ſummer ſeaſon, fulminating and emitting flaſhes (though, with all this, it ſcarce loſes any thing of the fire) ſo that the fire is not fixed in the Phoſphorus, but in a continual undulatory motion. Chemiſtry, ſays Dr. Shaw, hath ſcarce afforded any thing more ſurpriſing than the common Phoſphorus. To ſee letters traced with this matter become luminous in the dark, images and the bodies of men to blaze with light, and abundance of the like experiments, performed by means of Phoſphorus, muſt awaken the curioſity of thoſe who have ſeen theſe experiments, and render them deſirous of being acquainted with the method of preparing it. The preparation, even to this day, is kept as a ſecret in few hands, and the matter ſold at a very great price. Whence we apprehend it would be no unacceptable preſent to the world, to render this commodity cheaper, and diſcover its farther uſes.

The ſucceſsful method of preparing the Phoſphorus of urine is this.] Evaporate any quantity of freſh urine over a gentle fire, to a black and almoſt dry ſubſtance; then with two pounds thereof, thoroughly mix twice its weight of fine ſand; put this mixture into a ſtrong coated ſtone long neck; and having poured a quart or two of clear water into a large receiver, join it to the long neck, and work it in a naked fire: let the heat be ſmall for the firſt two hours; then increaſe it gradually to the utmoſt violence; and continue this for three or four hours ſucceſſively: at the expiration of which time, there will paſs into the receiver a little phlegm and volatile ſalt, much black and fœtid oil, and, laſtly, the matter of Phoſphorus, in form of white clouds, which either ſtick to the ſides of the receiver, like a fine yellow ſkin, or fall to the bottom in form of ſmall ſand. Now let the fire go out, but let the receiver continue till all be cold, leſt the Phoſphorus take fire on the admiſſion of the air. To reduce theſe ſmall grains into one piece, put them into a little tin ingot-mould, with water; heat the ingot to make the grains melt together; then add cold water, till the matter is congealed into one ſolid ſtick, like bees-wax; which being cut into ſmall pieces, fit to enter the mouth of a vial, may be preſerved by water, and keeping the glaſs cloſe ſtopped. If the glaſs were not to be ſtopped, the Phoſphorus would turn black on its ſurface, and at length be ſpoiled. The cautions required to make this proceſs ſucceed, are, 1. To evaporate the urine, while it is recent. 2. To prevent its boiling over, and by that means loſing the moſt unctuous part. 3. To let the matter afterwards ferment in the cold. 4. To mix the black matter with the ſand, to prevent its melting and running over. 5. To uſe a ſtone long neck, thoſe of earth being too porous, and ſuffering the Phoſphorus to tranſude ſooner, than paſs into the receiver. 6. To have the receiver very large, and with a very long neck, to prevent its breaking and over heating, which would either evaporate the white vapour wherein the Phoſphorus conſiſts, or elſe prevent its coagulating. 7. To put water into the receiver, for keeping it cool, and quenching the Phoſphorus, as it falls to the bottom. 8. To make the fire ſmall at firſt, that the long neck may be preſerved, and the black matter gradually dried; which would otherwiſe ſwell and run over in a black froth. 9. Laſtly, it is found neceſſary, that the urine for the operation be of ſuch as drink malt liquors, rather than wine. All theſe circumſtances being required for obtaining the Phoſphorus to advantage, it is no wonder that ſo many of thoſe who attempted it, miſcarried. This operation may be greatly ſhortened, by freezing and concentrating freſh urine; afterwards evaporating it with care; then digeſting it in the manner above mentioned. When thoroughly digeſted, commit the matter, in a large quantity, to an iron pot, with an earthen head, as the chemiſts uſually do for making ſpirit of hartſhorn, or the ſpirit and ſalt of urine: and when, by this method, all the ſalt and oil are obtained, let the caput mortuum be taken out, and mixed with twice its own weight of alum. The matter may now be put into well-coated long-necks, and worked with care in a reverberatory furnace, into large receivers filled with water, and connected to the long-necks by adopters, the lower ends whereof may enter the water, as in diſtilling of quickſilver; the operation being continued eight or ten hours. And this is apprehended to be the beſt way, hitherto known of procuring Phoſphorus to advantage. This Phoſphorus has been ſeveral ways diſguiſed, ſo as to make it appear under various forms; ſometimes as a ſolid, ſometimes as a liquid, ſometimes as an ointment, and ſometimes as a running mercury. Dr. Wall informs us, that Mr. Boyle, being concerned to find how ſmall a proportion of Phoſphorus was afforded by urine, deſired him to look out for another ſubject that might afford it in greater plenty. The doctor afterwards cauſing a piece of dry matter to be dug up in the fields where night men emptied their carts, he obſerved a great number of ſmall particles of Phoſphorus therein. This matter the doctor immediately carried to Mr. Boyle, who ſet Bilgar, the chemiſt, to work upon it; but he could obtain very little Phoſphorus from it, till another material was added to it in diſtillation; and then he procured Phoſphorus in ſuch plenty, that, ſelling large quantities at ſix guineas the ounce, he ſoon became rich, and left England. The matter which thus fixes and increaſes the Phoſphorus is apprehended to be alum, which is itſelf not only in ſome meaſure prepared from urine, but appears to afford the ſame kind of acid that Phoſphorus yields by burning; for, upon its analyſis, Phoſphorus appears to be a compoſition of a ſtrong acid and inflammable matter, exactly in the manner of common brimſtone, whence it may not improperly be called an animal ſulphur: and accordingly, like common brimſtone, it will burn under a glaſs bell, and afford flowers that become an acid liquor, like oleum ſulphurus per campanam, by attracting the moiſture of the air. This Phoſphorus has been employed for making curious experiments,

periments, a few whereof we ſhall here exhibit from Dr. Shaw. 1. The light of this Phoſphorus appears greater in vacuo than in the open air. 2. In hot weather it is obſerved to dart flaſhes of light through the water wherein it is contained, ſo as exactly to reſemble lightning; which thus darts unextinguiſhed through watry clouds and vapours. 3. Theſe flaſhes of light are not apt to kindle or burn any combuſtible matter, in which they reſemble the harmleſs kind of lightning; but in a condenſed ſtate this phoſphorus burns very furiouſly, and with a moſt penetrating fire, ſo as to melt and diſſolve metals; in which reſpect it again reſembles the more deſtructive kinds of lightning, which are found to have the ſame effects. 4. If a little piece of this phoſphorus be viewed through a microſcope the internal parts appear in a conſtant ebullition. 5. Though the phoſphorus appears to be a kind of ſulphur, yet it does not diſſolve in highly rectified ſpirit of wine, but communicates ſome ſulphureous parts thereto; for, if this ſpirit be poured into water in the dark, it yields a faint degree of light. 6. This phoſphorus, being mixed with a large quantity of pomatum, makes a ſhining unguent, which may be rubbed on the hands and face, without danger of burning, ſo as to render them luminous in the dark. Many other ſurpriſing experiments may be made with this phoſphorus, which is a ſubſtance that ſeems in chemiſtry to be much ſuch a thing as the loadſtone in natural philoſophy; and its effects almoſt as odd and difficult to explain, for want of knowing the latent properties of bodies.

To make a varniſh for Braſs, that will cauſe it to look like Gold.] Take two quarts of ſpirits of wine, and put them into a retort glaſs; then add to it an ounce of gumbuge, two ounces of lacca, and two ounces of maſtic: ſet this in a ſand-heat for ſix days, or elſe near a fire, or you may put the body of the bolt-head frequently into warm water, and ſhake it two or three times a day: then ſet it over a pan of warm ſaw-duſt. But before this varniſh is laid over the metal, let it be well cleaned. This is a good varniſh to mix with any colours that incline to red, and the amber-varniſh for thoſe that are pale.

To make a varniſh for any thing covered with Leaf Silver.] Firſt paint the thing over with ſize, and ground chalk or whiting; let them ſtand till they are thoroughly dry, and then do them over with very good gold ſize, of a bright colour (for there is much difference in the colour of it, ſome being yellow, and others almoſt white: the firſt is proper for gold, and the laſt for ſilver,) when this ſize is ſo dry, as that it will juſt ſtick a little to the touch, lay on the leaf ſilver, and cloſe it well to the fire.

Of Drawing in general.] Of all the polite arts, none have had ſo large a ſhare of admirers as that of Drawing, the number of them including almoſt all mankind: and no wonder, ſince it repreſents objects to us in ſuch pleaſant reſemblances, that we are apt to imagine we ſee things, which we really do not. It likewiſe teaches us to imitate all the works of the Creation: it brings to our remembrance things long ſince paſt, the deeds of people and nations long ſince dead, and repreſents to us the features and reſemblances of our anceſtors for ſeveral generations. There are few arts or profeſſions to which if drawing be not the parent, ſhe muſt, at leaſt, be acknowledged a kind of aſſiſtant; all deſigns and models being executed by drawing; mathematicians, architects, and navigators, daily practiſe it; it is uſed in moſt ſtations of life, from the general who commands an army, to the common mechanic. Nor have the ladies been leſs fond of this moſt excellent art; ſeveral of whom have acquired a great degree of perfection. The publick are greatly obliged to Mrs. Mariana, as well as to Miſs Smyth, and Miſs St. Laurence: the two laſt ladies have even excelled Heckel, in the flower way; and Mrs. Mariana's moſt ſurpriſing genius has excited our utmoſt admiration. To this lady we are remarkably obliged for the invention of a fine blue colour, little inferior to that of ultramarine (of which more will be ſaid in its proper place) and only remark here, that I ſhall endeavour to find a colour to anſwer that of carmine; by which means thoſe two extravagantly expenſive articles will be leſs called for, and the worthy fraternity of colourmen have leſs to anſwer for; as they have for many years impoſed, what they are pleaſed to call ultramarine, on the publick, at the very modeſt price of four, five, ſix or ſeven pounds per ounce; when, in fact, a better blue might have been produced for leſs than five ſhillings. And, indeed, much the ſame may be ſaid of carmine; it generally ſells from three to four pounds per ounce: I know the French carmine (which is the worſt made uſe of) at this time fetches two guineas and a half the ounce. I am ſorry to ſay this laſt article is too often made an improper uſe of; which, indeed, occaſions the great demand for it; and though the fair ſex have ſpent many hours very agreeable in the polite art of painting; yet I cannot help obſerving, that it is the greateſt abſurdity to endeavour to mend the works of the Creator, by laying on a pernicious colour, that will very aſſuredly ſoon render the moſt beautiful object dull and diſagreeable. But this is too tender a point to touch ſeverely; and ſhall only add, in this place, the words of Shakeſpeare's Polonius;

'Tis true, 'tis pity!—pity it is, 'tis true!

Humbly hoping, that the ladies of theſe kingdoms will ſoon diſdain the French faſhions; but, above all, abandon and abhor their vices *.

Rules to be obſerved in Drawing.] Drawing is the repreſenting, by lines or ſhades, the form or appearance of any thing in nature or art, the imitation of another draught, or the expreſſing, by lines and ſhades, any deſigns conceived in the mind. And as in imitating nature, or any draught, the mind is firſt impreſt with the form or ſhape of the figures; which by the operation of the hand, is afterwards expreſſed by lines, it will appear how neceſſary it is, that the mind ſhould be frequently uſed in a curious obſervance of what is propoſed to it, by which uſe it will conceive more fully and juſtly of objects, and the hand will delineate, with the greater eaſe and exactneſs, what is thus ſtrongly impreſt on the memory. In order to arrive at perfection, it is neceſſary to underſtand what is good and beautiful in a draught; in which knowledge the mind will make a quick progreſs, by comparing prints and draughts together. 'Tis a rock on which many painters have ſplit, they have ſatisfied themſelves with a bare imitation of bad pieces, without improving their genius, or acquiring a capacity to diſcover what are beauties, and what defects. Our ideas, in ſome meaſure, ought to ſerve us for a model, and if we would improve theſe, we muſt frequently view the performances of others; we ought to be nice and critical in obſerving ſuch as are correct and good; we ſhould meditate on every print and draught we ſee, make neceſſary reflections on them, and labour to fix in our minds a remembrance of their beauties, the freedom and boldneſs of the out-line, and the proportion of the ſeveral parts. If the judgment be well informed, the young practitioner will be enabled to make a much greater improvement than he can poſſibly do, if he proceeds in practice, without increaſing in judgment. The labour of the hand muſt ſecond and ſupport that of the brain; 'tis impoſſible to become an able artiſt, without making the art habitual, and a perfect habit is not to be gained, without a great number of acts, and without conſtant practice. In all arts, the rules of them are to be learned in a ſhort time; but the perfection of them is not acquired without practice and diligence. It is a true maxim, that lazineſs never produced any thing that was excellent; to be perfect in drawing, 'tis neceſſary that the hand ſhould be improved in practice, and the mind in judgment every day. Morning is the beſt and proper part of the day for buſineſs; employ it therefore in the ſtudy and exerciſe of thoſe things which require the greateſt pains and application. The firſt care ſhould be employed in imitating ſtraight and curved lines, ſquare, round, regular, irregular, and inanimate figures, alſo parts or out-lines of flowers, &c. &c. This will be a good platform on which to erect the building; for by this labour you will attain a facility of hand, a freedom and exactneſs of drawing lines, and a cuſtomary exerciſe of patience; qualifications, without which no one can apply himſelf with pleaſure and diligence in the exact imitation of the moſt difficult objects, which will require a longer time, and more art in copying. The circumferent ſtrokes are called out-lines; and the excellency of a good out-line conſiſts in freedom, boldneſs, and the exact proportion of all its parts. Always begin your copy at the top; and draw the right-ſide of the figure firſt, for by that means the ſtrokes are always expoſed to the eye; the reſt will follow more naturally, and give leſs trouble. Be content for ſome time, to practiſe after a good out-line, without attempting at finiſhed pieces, or even without ſhading your own draught: ſketch your out-line at firſt with ſlight touches, and faint, that the amendment of it, when neceſſary, may be the better performed, without appearing to be re-touched: endeavour after the moſt exact imitation in every ſtroke; and when you correct the out-line, by taking away a little of ſome parts, and ſwelling others, mind that you loſe nothing in the freedom and boldneſs of it. Compare your copy frequently with the original, carefully obſerving what is amiſs, that a fault may not eſcape you without correction, and that in the next draught you make after the ſame original, you may avoid thoſe errors; for you are not to make new tranſitions from one original to another, till you have obtained in ſome meaſure a proficiency in the firſt. Many ſketches of the ſame figure, in every one endeavouring to exceed the former, is the ſureſt way of practice. Be ſlow in your firſt operations; a conſtancy of practice will be ſure to make your hand expeditious; learners muſt overcome their paſſions by the exerciſe of patience; they muſt proceed ſlowly and prudently in their firſt attempts, and make it their care rather to perform well, and to ſecure every ſtroke, and by that means make one good draught, than in a heedleſs manner to hurry over a number of bad ones. The ſame may be ſaid with regard to moſt other arts. Before you begin your work, and whilſt you are at it, view your original with cloſe attention; divide it in your mind in ſeveral parts; obſerve the length, the breadth, and the ſimilitude of each part; conſider their proportion to each other, and to the whole; the diſtances from one part to the other, and what parts lie parallel to each other. After you have done your copy, and your mind perhaps been employed about other affairs, you ſhould view them afreſh, for many faults will then appear, that were not diſcovered before; and whatſoever pains you beſtow on frequent reviewing and comparing the original with your own copy, will not only ſerve to perfect you in that particular draught, but will alſo improve you in the knolwedge of lines, draughts, and proportions, and by practiſing in that method, you will be the ſooner qualified for the more nice and neareſt imitations. The out-lines muſt be drawn in a flowing, gliding manner, large and ſmooth, for when they are too ſtreight, they appear ſtiff; but, when performed in the manner here directed, they have the reſemblance of life and motion. What other inſtruments are neceſſary, will be found in the following pages; and ſhall now direct to the

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* The French are ſo fond of painting their faces, that it is even done publickly; the mother teaches her daughter this pernicious art; and the men do it as frequent as the women.

Proper Materials for Drawing.] Theſe are either black-lead pencils, or black-lead fixed in a portcrayon, charcoal, red, black, or white chalk, paſtils or crayons, pens, or hair-pencils, and Indian-ink. Black-lead is as proper, in the beginning, to practiſe after the plain lines, &c. as any other material: the ſtroke it makes being ſmooth, will be more pleaſing than what is effected by charcoal or crayons. It muſt have a fine point, and accuſtom yourſelf to hold it long in your hand, that the end of your fingers may be at a much greater diſtance from the point, than they are from the nip of a pen in writing, and form your ſtrokes with light gentle touches, by which means you will obtain a greater command of hand, and your out-line will be more free and bold. Pens are ſometimes uſed in ſhading draughts, by hatching them with croſs ſtrokes: but this is better done with hair-pencils and Indian-ink, which is uſed in the ſame manner as water colours. The ſhades in hatching are effected by lines, and appear like the ſtrokes which ſhade an engraved print: but contrary to this, in uſing the hair-pencil and Indian-ink, there do not appear any lines, but the ſhades look like thoſe in a mezzotinto print.

Of Lights and Shadows.] It is the artful management of lights and ſhades that gives the appearance of ſubſtance, roundneſs, and diſtance, to whatever bodies we repreſent. Imagine you draw a circle on a piece of paper; conſider this circle, when it is firſt formed, or fill it up with any even colour whatever, and it will appear to be a body with a round circumference, and flat ſides: but, if you let the ſtrongeſt of the colour remain in the middle, and gradually weaken it towards the circumference, it will, by this means, pleaſingly deceive the ſight, and receive a convex appearance like a ball or globe. Wherever the vivacity of colour is ſtrongeſt, that part of the object catches the ſight firſt, and appears neareſt to it: whereas its weakneſs and goings-off are more and more broken and faint, and ſeem to fly farther from the ſight. In rounding the parts of any object, the extremities in turning muſt loſe themſelves inſenſibly and gradually, without precipitating the light all of a ſudden into the ſhadows, or the ſhadows into the light; but the paſſage of the one into the other muſt be eaſy and imperceptible; that is, the ſhadow muſt be ſoftened gradually, till it loſes itſelf in light. Objects that are painted light, muſt have a ſufficient breadth of ſhadow to ſuſtain them; and dark bodies muſt have a ſudden light behind, to detach them from the ground, or from thoſe objects that are placed behind them, otherwiſe they will confuſedly appear, as ſticking upon each other; whereas the oppoſition of ſhade to a light object, and of light to a dark one, gives a projection, and ſeparates them from other bodies. The nearer any object is to the eye, it is ſeen ſo much the ſtronger and plainer; the ſight is weakened by diſtances; and the more remote any object is, 'tis ſeen in a more imperfect manner; therefore theſe objects that are placed foremoſt to the view, ought to be more finiſhed than thoſe that are caſt behind; and they ſhould have ſuch a relative dominion over each other, that as the object, by its heightenings, cauſes others to retire more backward, ſo the ſame object muſt be chaced, and made to appear farther from the ſight, than others which are more ſtrongly illuminated. It is not ſufficient that remote objects be only coloured in a more faint and languid manner, but, according to their diſtance and parts, muſt appear more or leſs confuſed; the eye does not minutely diſcover what is ſeparated from it. At the length of a field or ſtreet, we deſcry human figures, but the features of their faces, and the folds of their garments, are imperceptible to us; and ſo the innumerable leaves that grow on diſtant plantations, appear to the ſight but one maſs.

Directions for mixing and making colours.

YELLOW. GUMBUGE is a moſt beautiful yellow; by putting water to a lump of this, it ſoon diſſolves, and is made paler or deeper to your liking: but no gum water is to be uſed, it being a gum itſelf; nor ſhould this yellow be uſed on prints deſigned to be varniſhed, for the varniſh takes this colour quite off. This is ſold cheap, and may be had at any druggiſt's.

Gall-Stone is a fine tranſparent colour of an orange tinge, very fit to glaze with, or to ſhade the yellow with.

Dutch-Pink is another yellow, and ſhould be uſed when prints are deſigned for varniſhing.

GREEN. *Diſtilled Verdigriſe* is a bright ſhining green, to be uſed very ſparingly, and with judgment: but the addition of a little Gumbuge makes it look far pleaſanter. This is bought in phials, ready prepared: the colour-men tell you, it is very troubleſome to make: and no doubt, ſell it dear.—But more of this in its proper place.

Sap-Green is a lump diſſolved in water: and is uſed with moſt advantage when plenty of water is put to it: otherwiſe it is very dark and unpleaſant.

French-Berries, are to be diſſolved in water, and afford but an odd kind of green, unleſs mixed with ſome other article. Gum-water is not to be uſed with theſe berries: or with the Sap-Green above-mentioned.

Indigo and Gumbuge, mixed together, make a very agreeable green: and you may ſuit it to your liking, as you put more or leſs of the Gumbuge: but judgment and fancy muſt direct what tinge is moſt agreeable in this and all other colours.

BLUE. *Ultramarine*, is the fineſt of all blues; it is ſold extravagantly dear; but indeed a very little goes a great way, when it can be procured of the right ſort: which is indeed rarely to be met with, notwithſtanding the high price it bears.

Smalt, if very fine, is a good blue: of itſelf it is but a heavy colour, difficult to lay ſmooth, and be tranſparent: on which account care and judgment are required in uſing it.

Indigo, a deep heavy blue, proper for a dark ſhade, &c.

Verditer, a fine ſky-blue; but it is to be uſed ſparingly, and with diſcretion.

Pruſſian-Blue, is a fine blue, if laid on very thin, and proper to ſhade other blues with: but it is beſt when uſed in oil-colours.

CRIMSON and RED. *Carmine*, is the fineſt of all Reds; it affords a bright and beautiful colour, when good, and flows eaſily in the pencil; and with the ſame colour, or lake, you may make the ſhades as ſtrong as you pleaſe.

Lake, is likewiſe a fine tranſparent colour, and is, when of a good kind, preferable to ſome Carmine.

Red-Lead, a powder, if fine, affords a good colour; but it being of a heavy nature, care muſt be taken that it be not laid on too thick, which would prevent its being tranſparent: it is likewiſe apt to turn blackiſh, unleſs it be well cleanſed and refined. See waſhed red-lead.

Vermillion, we may ſay the ſame of as of the Red-Lead.

ORANGE. Lay firſt a tint of Gumbuge, and over that ſome Red-Lead, or Carmine, or Lake, either will do.

PURPLE. *Carmine and Ultramarine*, mixed together, make the fineſt of all purples.

The above colours, by blending two together, may be altered to quite another tint: though in doing this, no certain rule can be laid down, but fancy, with judgment, muſt direct. In uſing the colours, great care ſhould be taken to lay the firſt colour on very thin, or pale, by which means the ſhade will appear ſtronger, and the whole more beautiful. In moſt caſes, if the white paper was left in the lights of the object, whether flower, or figure, and only the ſhades to be coloured, would be beſt: or, ſhould the white paper be thought to appear in too glaring a light, then (afterwards) a very thin tint may be laid on. And this caution I would adviſe to be univerſally obſerved, to lay on all colours very thin at firſt, it being eaſy to make the light parts deeper; but the damage is not eaſily repaired, when the colour is laid on too thick at firſt.

Some neceſſary Remarks on Colours, &c. As the preparation of diſtilled verdigriſe is pretended to be both tedious and troubleſome, I will here put it in the practitioner's power to make his own; which, if my directions are followed, I will anſwer for its being full as good, if not better, than what is ſold at the colour-ſhops.

Diſtilled verdigriſe, uſed in colouring prints, and in the preſent mode of painting, is a liquid, and which I have before mentioned, as ſuch, under the article of greens. You are to procure an ounce of diſtilled verdigriſe, in the lump, which will coſt about eight pence; this you are to bruiſe ſmall, and then put it into twelve ounces of the beſt white wine vinegar, which muſt be not only ſtrong, but very fine; ſhake it well in the bottle, at firſt putting in, and let it ſtand in the ſun, or ſome place that is warm, for a day or two, often ſhaking it, and it will then be fit for uſe. This is the very extraordinary trouble of making the liquid diſtilled verdigriſe, and for which the venders are ſo well paid. They, indeed, add about a ſpoonful of brandy to the above quantity; which can only be to diſguiſe it, as it cannot do the leaſt ſervice: in common writing ink, brandy is ſaid to prevent its turning mouldy, &c. but I have uſed the article above-mentioned both with and without the brandy, and kept it many months, and could not perceive the difference; but that is the preparation of the ſhops. You are, however, to remark, that this liquid is beſt kept on the fine powder that you will perceive at the bottom of the bottle, being no way troubleſome, and will ſoon precipitate, and be fine for uſe: it being beſt to pour off a very ſmall quantity into a bottle or gallipot, when you are uſing it. A little of this goes a great way: it flows well in the pencil, and may be uſed with a pen, even as well as common writing ink, if required. It is a very ſhining green, but may be made pleaſant and agreeable, by mixing more or leſs gumbuge with it, according as your fancy directs, or circumſtances require.

I ſhould have mentioned Saffron among the yellows, as being the higheſt of all, and appearing fine and delightful; but as this colour is very apt to fly, I muſt own, I make very little uſe of it; and not at all, without being well loaded with gum; nor will it bear varniſh by any means.

As a good Blue is the moſt difficult to procure, eſpecially at an eaſy price, I will here inſert a very valuable one; I don't give it as an invention of my own, but acknowledge we are indebted to the ingenious Mrs. Mariana for it, as I have before hinted; and it is thus prepared, according to her directions.

"Take, ſays ſhe, half an ounce of the fineſt "Litmus: it muſt be powdered very fine; Pruſſian "Blue half a drachm, powdered very fine likewiſe: "eight ounces of the cleareſt ſmall beer wort, while "it is running: the above articles are to be thrown "into the wort while warm; they are then to be "put into a new earthen veſſel, that is extremely "well glazed, and remarkably ſweet and clean; to "be ſet over a moderate fire till it boils, then to be "taken off, ſtand till cold, and it is to be kept for "uſe. N. B. If this is made in ſummer time, "when corn is near ripe, throw in, when cold, "half a ſcruple of thoſe fine blue flowers that are "often to be found among wheat, as it grows in the "fields: it will be a moſt heavenly blue; but great "care muſt be taken that it touches not the leaſt "acid, for that ſpoils all."

Mrs. Mariana gives great caution, to beware that acid interferes not in the above curious colour: but the greateſt difficulty ſeems to me to know how to prevent it.—For, ſuppoſing that the wort in itſelf had no acid property when firſt made uſe of; yet in a hot ſeaſon it would no doubt be not only acid, but even very ſour, a few days after making, and thereby become uſeleſs, if ſo very trifling an acid, as ſhe obſerves, would deprive it of its beauty; and which I myſelf have often experienced, and found to be true. In fact, the colour is truly beautiful, and I have generally ſucceeded in the preparation when I obſerved the following cautions, viz. Firſt, that the earthen veſſel (for no other will anſwer the end) be well glazed and clean; I then throw in a large lump of fine ſoft chalk, add as much water thereto as will fill the veſſel, and then ſet it on a ſlow fire 'till it is very hot; I afterwards cover it up and let it remain three or four hours, and then clean it very well. Secondly, I procure my new wort after the following manner: having obtained about four ounces of the fineſt pale malt, I put this into a tea-pot, without being either ground or even bruiſed; and put about twelve ounces (three quarters of a pint) of fine ſoft river water, boiling hot, thereto; I let this ſtand near the fire, ſo as to keep it warm, an hour, afterwards I pour it off, and it will be fit for the uſe according to the directions of Mrs. Mariana. It is to be obſerved, that the water, of which the wort is made, ought to be of the moſt pure kind, very ſoft, and extremely fine; for much depends on it. And 'tis not to be wondered at that many have miſcarried in making this curious article, ſince they all procure the wort from any one that happens to be brewing. I muſt own I have made an extreme good Blue with only the Litmus (it is beſt known by the name of Lacmus, and ſells for about four pence the ounce) being powdered and gently boiled in the fine wort above-mentioned; it will ſoon jelly and grow hard, and will keep in that manner for a year, or more; it is made liquid immediately, by only dipping the pencil in fair ſoft water, and touching it as you do Indian-ink.

I am not in this place going to treat of the common black writing ink; perhaps it might well anſwer the end of thoſe who make and deal in it, to be better acquainted with the eaſy preparation of wort and litmus boiled together. This, without much care, trouble, or expence, will make a good blue, that will flow in the pen better than the ink commonly made uſe of; and as to its growing ſoon hard (and more ſo, if long boiled, and left to cool in very ſmall quantities) it is a property that makes it far more valuable, eſpecially for thoſe who travel; becauſe it will keep, in a dry place, a long time, and ſoon liquify again. In one word, it will make the beſt black writing ink in the univerſe, with the addition of ſome bruiſed galls, &c. but in this caſe, no gum is to be uſed.—It may be remembered, that all good blacks ſhould be raiſed from blues.

Mariana's fine blue has got diſcredit by ſome, from a circumſtance little thought of. I remember lady Ferrers, after ſaying a great deal in its favour, complained, that it would not hold its colour. Know then, that a great part of the fine writing paper has what the makers call an allum ſize laid on it, which intirely ſpoils this fine tender blue; and ſo it does a ſort of mixture—too often ſold for ultramarine. But paper, ſized after this manner, is ſoon known, by only putting the tongue thereto.

I make a blue that I find of good ſervice after the following manner: having procured ſome of the fineſt Pruſſian blue, I powder it, and grind it well with a ſtrong gum-water, made of the cleareſt ſort of gum-arabic. After it is ſufficiently fine, I add ſome flake white thereto, which I alſo grind well in; and by adding more or leſs of the white, I make it lighter or darker, to my fancy. But, indeed, I generally keep three or four degrees, which I make up into ſmall ſquares, and uſe it in the ſame manner I do the Indian-ink.

There is a ſort of Brown, much uſed by thoſe who colour prints, which is quite tranſparent, and to be had in all places: procure a ſmall quantity of the moſt mild pale tobacco; put a very little of this to a ſpoonful of common water in a cup or gallipot, and in a few minutes you will have a good brown colour, that ſuits on many occaſions; and it may be made quite dark, by adding more of the leaf, or by putting hot water to it. Gum-water is not to be uſed with this article, unleſs it be very weak. I know an objection will be made againſt the tobacco on account of its ſmell; but it is a miſtake, for the ſmell goes off immediately: indeed the colourmen don't approve of it; and I well know the reaſon of their diſlike; it would be the beſt of browns, if they could contrive to diſguiſe it, and ſell it at a great price, as they do many of their other articles, which in themſelves are very trifling.—Pray how does their Gall-ſtone, &c. ſmell?

Roſe-pink is no bad colour, if of a good ſort: this I manage as I do the Pruſſian-blue, and keep it dry in a cake; two ſorts will be ſufficient, one lighter than the other; which is made by the addition of the flake-white, as directed in the blue.

Black ſhould never be mixed with any colour, becauſe it makes it look diſagreeable and dirty. Indeed I ſeldom uſe any other black than Indian-ink, nor other white than flake-white, though I know white-lead is often uſed; but the other is beſt.

Waſhed red-lead is a fine colour, and comes reaſonable; nor is the trouble much to prepare it. You are to procure half a pound of the fineſt red-lead, which muſt be finely powdered: put this into a mug, and ſtir it about well in near a quart of clear ſoft water; pour the water off into another mug, ſtir it about, and again pour it off; ſtir it, and pour it off again, and do in this manner ſix or ſeven times, always obſerving to pour as long as it will run, and leave the powder that precipitates to the bottom of each mug (which will grow leſs and leſs) to dry; and though, in the whole, you will not have above half a drachm; yet, if the red-lead was good, you are ſure of a fine colour left at the bottom of each mug, which will ſoon dry, and may be ground with gum-water, and kept in ſhells for uſe.

Vermillion may ſometimes be improved in the ſame manner; but as there are different preparations of it, and ſome of them will not anſwer this operation, I would by no means adviſe it.

Logwood boiled in clear ſtale Beer, and a little fine Brazil wood added thereto, makes a tolerable purple, which remains liquid.

But a good purple, intended for keeping, is to be made thus: new wort one pint, litmus one ounce, fine Braſil, bruiſed, one ounce, let theſe boil over a ſlow fire, about half an hour, in a clean new mug, well glazed. When cold, ſtrain it off, and keep it for uſe. If this is left in ſmall quantities, it will be apt to jelly and grow dry: but, if deſigned to be kept liquid, add a little ſpirits of wine thereto, and keep it in a large bottle.

A delightful red, not inferior to carmine, is made thus; ſpirits of wine eight ounces, of the fineſt lake one drachm, ripe barberries half an ounce, dragons-blood, of the reddeſt ſort, one drachm, fine brazil-wood a quarter of an ounce; this is to remain ſeven or eight days, in the ſun, or moderate heat, in a phial well corked; you are to ſhake the bottle often; and after you ſee the colour very high and delightful, which it will be in little more than a week, let it ſettle, and pour it off for uſe. It ſhould be in a clear flint-glaſs bottle, that you may the better obſerve the colour. After ſtanding ſome time, and you find it very fine, you may put a few drops in a ſhell, or on a Dutch-tile, ſmooth glaſs, &c. which will ſoon dry; you may then rub into it a little clear gum-water, which gives it a better body, or it may be uſed liquid in many caſes.

The colours I have already mentioned, are ſufficient, by being blended together, to form a ſufficient variety for moſt purpoſes, and for doing which I can lay down no certain rule, but muſt leave it to the fancy and judgment of the practitioner.

To make a Varniſh for Silver.] Melt, in a well glazed pipkin, ſome fine turpentine, and put in three ounces of white amber, finely powdered (more or leſs, according to the quantity your work will require) put it in by little and little, keeping it continually ſtirring, adding by degrees, ſome ſpirit of turpentine, till all the amber is diſſolved: then add to it an ounce of Sarcocolla well beaten, and an ounce of gum elemi well levigated, adding now and then a little ſpirit of turpentine, till all is diſſolved: do this over a gentle fire, and keep it conſtantly ſtirring. This varniſh is to be uſed warm, and hardened by degrees in an oven, whereby it will look like poliſhed ſilver.

Manner of Engraving on Copper, &c.] This is performed with the graver on a plate of copper, which being well poliſhed, is covered over thinly with virgin-wax, and then ſmoothed while warm, with a feather, ſo that the wax be of an equal thickneſs on the plate: on this the draught or deſign, done in black lead, red chalk, or ungummed ink, is laid with the face of the drawing on the wax: then they rub the back-ſide, which will cauſe the whole deſign of the drawing to appear on the wax. The deſign, thus transferred, is traced through the copper, with a point, or needle: then beating the plate, and taking off the wax, the ſtrokes remain to be followed, heightened, &c. according to the tenor of the deſign, with the graver, which muſt be very ſharp, and well pointed. In the conduct of the graver conſiſts almoſt all the art, which depends not ſo much upon rules, as upon practice, the habitude, diſpoſition, and genius of the artiſt, the principles of engraving being the ſame with thoſe of painting; for if the engraver be not a perfect maſter of deſign, he can never hope to arrive at any degree of perfection in this art. In conducting the ſtrokes or cuts of the graver, he muſt obſerve the action of the fingers, and of all their parts, with their out-lines; and remark how they advance towards, or fall back from his ſight, and then conduct his graver, according to the riſings or cavities of the muſcles or folds, widening the ſtrokes in the light, and contracting them in the ſhades: as alſo at the extremity of the out-lines, to which he ought to conduct the cuts of the graver, that the figures or objects repreſented, may not appear as if they yawn; and lightening his hand, that the out-lines may be perfectly ſound, without appearing cut or ſlit: and although his ſtrokes neceſſarily break off where a muſcle begins, yet they ought always to have a certain connection with each other, ſo that the firſt ſtroke ſhould often ſerve to make the ſecond, becauſe this will ſhew the freedom of the graver. If hair be the ſubject; let the engraver begin his work by making the out-lines of the principal locks, and ſketch them out in a careleſs manner, which may be finiſhed, at leiſure with finer and thinner ſtrokes to the very extremity. The engraver muſt avoid making very acute angles, eſpecially in repreſenting fleſh, when he croſſes the firſt ſtrokes with the ſecond, becauſe it will form a very diſagreeable piece of tabby-like lattice work, except in the repreſentation of ſome clouds, in tempeſts, the waves of the ſea, and in repreſentations of ſkins of hairy animals, and leaves of trees. So that the medium between ſquare and acute ſeems to be the beſt and moſt agreeable to the eye. He that would repreſent ſculpture, muſt remember that, as ſtatues, &c. are moſt commonly made of white marble, or ſtone, whoſe colour does not produce ſuch dark ſhades as other matters do, have no black to their eyes, nor hair of the head, and beard flying in the air. If the engraver would preſerve one quality and harmony in his works, he ſhould always ſketch out the principal objects of his piece before any part of them are finiſhed. The inſtruments neceſſary for this ſort of engraving are, beſides a graver, a cuſhion, or ſand bag, made of leather, to lay the plate on, in order to give it the neceſſary turns and motions; a burniſher made of iron, or ſteel, round at one end, and uſually flattiſh at the other, to rub out ſlips and failures, ſoften the ſtrokes, &c. a ſcraper, to pare off the ſurface, on occaſion; and a rubber of a black hat, or cloth rolled up, to fill up the ſtrokes, that they may appear the more viſible.

Method of Etching on Copper, &c.] Etching is a method of engraving on copper, in which the lines, or ſtrokes, inſtead of being cut with a tool or graver, are eaten in with aquafortis: and this is done with more eaſe and expedition than engraving; it requires fewer inſtruments, and repreſents moſt kind of ſubjects better and more agreeable to nature, as landſcapes, ruins, grounds, and all ſmall, faint, looſe, remote objects, buildings, &c. The method of etching is as follows: chooſe the copper plate as directed for graving, and furniſh yourſelf with a piece of ground, tied up in a bit of thin ſilk, kept very clean, to be laid upon the plate when both have been warmed; proper needles to hatch with on the ground; a pencil or bruſh to wipe away the bits of ground which riſe after hatching; a poliſher; two or three gravers; a pair of compaſſes, to meaſure diſtances and draw circles; a ruler, to hatch ſtraight lines; green wax, to make the wall round the edges of the plate, to contain the aquafortis; an oil ſtone; a bottle of aquafortis; ſome red lead, to colour the back ſide of the copy; a ſtift, and a hand-vice, to hold the plate over the candle. To make the ground, take three ounces of aſphaltum, two ounces of clean roſin, half an ounce of burgundy-pitch, three ounces of black wax, and three ounces of virgin's wax: let all theſe be melted in a clean earthen pipkin over a ſlow fire, ſtirring it all the time with a ſmall ſtick: if it burn to the bottom, it is ſpoiled. After the ingredients are well melted, and it boils up, put it into a pan of fair water: and before it be quite cold, take it out, and roll it into ſmall lumps to be kept from duſt: this ground is what others call the varniſh. The next thing is to clean the plate to receive the ground: take a piece of liſting, roll it up as big as an egg, tie it very tight, ſo as to make it a rubber, and having dropped a ſmall quantity of ſweet oil, and added a little powder of rotten ſtone on the plate, rub it with this ball, till it will almoſt ſhew your face. Then wipe it all off with a clean rag, and after that, make it quite dry with another clean rag, and a little fine whiting. The next thing is to lay on the varniſh: to do which aright you muſt take a hand-vice, and fix it at the middle of one part of the plate, with a piece of paper between the teeth of the hand-vice and the plate, to prevent the marks of the teeth: then laying the plate on a chafing diſh, with a ſmall charcoal fire in it, till the plate be ſo hot, that by ſpitting on the backſide, the wet will fly off; rub the plate with the ground tied up in ſilk, till it be covered all over; and after that dawb the plate with a piece of cotton wrapped up in ſilk till the ground be quite ſmooth, keeping the plate a little a little warm all the time. The varniſh being thus ſmoothed upon the plate, it muſt be blacked in the following manner: take a thick tallow candle that burns clear, with a ſhort ſnuff, and having driven two nails into the wall, to let it reſt upon, place the plate againſt the wall with the varniſh ſide downward, and take care not to touch the ground with your fingers: then taking the candle, apply the flame to the varniſh as cloſe as poſſible, without touching the varniſh with the ſnuff of the candle, and guide the flame all over it, till it becomes perfectly black. After this is done, and the plate dry, the deſign is traced with a needle through the varniſh, and a rim or border of wax is raiſed round the circumference of the plate; and then the artiſt has a compoſition of common varniſh and lamp black, made very thin, wherewith he covers the parts that are not to be bitten, by means of a hair pencil. And he is every now and then covering or uncovering this or that part of the deſign, as occaſion may require; the conduct of the aquafortis being the principal concern, on which the effect of the print very much depends. The operator muſt be attentive to the ground, that it does not fail in any part, and where it does, to ſtop up the place with the above compoſition. The plate is defended from the aquafortis every where, but in the lines or hatches cut through it with the needle, through which the water eats into the copper to the depth required; remembering to keep it ſtirring with a feather all the while, which done, it is to be poured off again. Single aquafortis is moſt commonly uſed; and if it be too ſtrong, mix it with vinegar, otherwiſe it will make the work very hard, and ſometimes break up the ground: the aquafortis having done its part, the ground is taken off, and the plate waſhed and dried; after which nothing remains for the artiſt but to examine the work with his graver, to touch it up, and heighten it where the aquafortis has miſſed. And, laſtly, it is to be remembered, that a freſh dip of aquafortis is never given, without firſt waſhing out the plate in fair water, and drying it at the fire.

Different Ways of making Carmine.] It is extracted from cochineal, by means of water, wherein chouan and antour have been infuſed: ſome add rocou, but this gives too much of the oval caſt. Others make carmine with brazil-wood, fernambouc, and leaf gold, beat in a mortar, and ſteeped in white wine vinegar: the ſcum ariſing from this mixture, upon boiling, when dried, makes carmine; but this kind is vaſtly inferior to the former. There is another carmine, made of brazil-wood and fernambouc. But a ſort, that is too often met with, is prepared from ſhreds of ſuperfine ſcarlet cloth, infuſed in ſpirits of wine.

The Preparation of Ultramarine.] This is prepared from lapis lazuli, by calcination: but the German lapis lazuli does not anſwer well in this proceſs, and diſcovers itſelf by calcining eaſier than the African or Aſiatic, and turning greeniſh. The oriental kind calcines to a finer blue than it naturally has, and retains the colour for ever. After calcining the ſtone in a clear fire of charcoal, they grind it to an impalpable powder on a porphyry, and then mixing it up in a paſte, compoſed of pitch, wax, and oil, they work it about with the hands: and finally, kneading this in a veſſel of clear water, as the powder ſeparates from the viſcid matter, it ſinks to the bottom: when all that is perfectly fine in this is worked out, they let the water be drained off and dry the powder for uſe. What remains embodied in the paſte is afterwards ſeparated, and makes a worſe kind than the former. Ultramarine muſt be choſen of a high colour, and well ground, which may be known by putting it between the teeth, and if it feel gritty, it is a ſign it has not been well ground. To know whether it be pure and unmixed, put a little of it into a crucible, and ſo heat it red-hot; and if the powder has not changed its colour after this trial, it is certainly pure; on the contrary, if there be any change, or any black ſpecks in it, then it has been adulterated. There is alſo a ſpurious ſort, commonly called Dutch ultramarine, which is only fine ſmalt well ground and pulveriſed : and this ſort is too often ſold at a moſt extravagant price.

To ſoften Ivory and other Bones.] Lay them for twelve hours in aquafortis, and then three days in the juice of beets, and they may be worked into any form. To harden them again, lay them in ſtrong vinegar. Dioſcorides ſays, that by boiling ivory for the ſpace of ſix hours with the root of mandragoras, it will become ſo ſoft, that it may be managed as one pleaſes.

To whiten Ivory] Lay it in quick lime, and pour a little water over it, but not too much that the heat may not be too great, leſt it ſcale and become brittle.

Staining and marbling of Ivory.] 1. Of a fine coral red : make a lye of wood aſhes, of which take two quarts, pour it into a pan upon one pound of braſil ; to this add one pound of allum ; boil it for half an hour : then take it off, and put in the ivory, or bone, and the longer either of theſe continue in the liquor, the redder they will be. 2. Of a fine green : take two parts of verdigriſe, and one part of ſal ammoniac : grind them well together, pour ſtrong white wine vinegar on them, and put your ivory into this mixture, let it be covered till the colour has penetrated, and as deep as you would have it. If you would have it ſpotted with white, ſprinkle it with wax ; or if you would have it marbled, cover it with wax, and ſcrape it off in veins, having all the lines uncovered which you deſire to have ſtained. 3. Of black : take litharge and quick lime, of each an equal quantity ; put them in rain water over the fire till it begins to boil, and in this put the bone or ivory, ſtirring them well about with a ſtick ; and afterwards, when you ſee the ivory receive the colour, take the pan from the fire, ſtirring the ivory all the while till the liquor is cold. 4. Marbling upon ivory is performed thus : melt bees-wax and tallow together, and lay it over the ivory, and with an ivory bodkin open the ſtrokes that are to imitate marbling: pour the ſolution of ſome metal on them, and when it has ſtood a ſhort time, pour it off: when it is dry, cover the ſtrokes again with the wax, and open ſome other veins with your bodkin for another metallic ſolution; and this repeat to the number of colours you deſign to give it. The ſolution of gold gives it a purple; of copper, a green; of ſilver, a bad black; of iron, a yellow and brown. By this method you may alſo imitate tortoiſe-ſhell, and ſeveral other ſubſtances on ivory.

The true Method of making Sealing-Wax, &c.] Take one pound of Bees-wax, three ounces of fine turpentine, olive-oil, and roſin (finely powdered) of each one ounce: when they are well melted, and droſs taken off, put in an ounce and a half of vermillion, or red-lead, finely ground, and ſtir them together till they are well incorporated, when this mixture grows a little cool, roll it into ſticks, or in any other form you would have it. If you would have it black, inſtead of vermillion, or red-lead, put in lamp black.—The ſoft, red, and green wax, uſed in large ſeals to ſome of our law writings, are thus made: melt bees-wax over a gentle heat; with ſuch a proportion of Venice turpentine as, when cold, will give it the due conſiſtence: this is determined by repeated trials; firſt putting in but little turpentine, and afterwards more and more, till by dropping a piece upon a marble to cool, it is found of the true conſiſtence. They then colour it with vermillion, or red-lead, or with verditer, or whatever colour they pleaſe, the mixture in this ſtate, receiving any.

To imitate Fruit in Wax.] Take the fruit, and bury it half way in clay; oil its edges, and that part of the fruit which is uncovered: then nimbly throw on it tempered alabaſter, or plaſter of Paris, to a conſiderable thickneſs. When this is grown dry and hard, it makes the half mould; the ſecond half of which may be obtained in the ſame manner. The two parts of the mould being joined together, a little bees-wax melted and brought to a due heat, being poured through a hole made in a convenient part of the mould, and preſently ſhook therein, will repreſent the original fruit.

How to repreſent the Face, &c. in Wax.] The repreſentation of the face, &c. of perſons living, or dead, is done by applying plaſter of Paris in a kind of paſte, and thus forming a mould containing the exact repreſentation of the features. Into this mould melted wax is poured, and thus a kind of maſks are formed; which being painted and ſet with glaſs eyes, and the figures dreſſed in their proper habits, they bear ſuch a reſemblance, that it is difficult to diſtinguiſh between the copy and the original.

Of Varniſhes in General.] There are ſeveral kinds of varniſhes in uſe; as the ſiccative or drying varniſh, made of oil of aſpin, turpentine, and ſandarach melted together. White varniſh, called alſo Venetian varniſh, made of oil of turpentine, fine turpentine, and maſtic. Spirit of wine varniſh, made of ſandarach, white amber, gum elemi and maſtic; ſerving to gild leather, picture frames, &c. withal. Alſo the gilt varniſh, china-varniſh, common varniſh, &c.

To make white Varniſh.] Take gum ſandarach, of the cleareſt and whiteſt ſort, eight ounces; gum maſtic, of the cleareſt ſort, half an ounce; of ſarcocolla, the whiteſt, three quarters of an ounce; Venice turpentine, an ounce and a half; benzoin, the cleareſt, one quarter of an ounce; gum animæ, three quarters of an ounce; let all theſe be diſſolved, and mixed in the manner following: Put the ſarcocolla and roſin into a little more ſpirits than will cover them to diſſolve: then add the benzoin, gum animæ, and Venice turpentine, into either a glaſs or glazed earthen veſſel, and pour on as much ſpirits as will cover them an inch: then put the gum maſtic into a glaſs or glazed veſſel, and pour ſtrong ſpirits upon it, covering it alſo about an inch thick, to diſſolve it rightly: then put your gum elemi in a diſtinct veſſel as before, and cover it with ſpirits to diſſolve. For this purpoſe, you need only break the roſin a little, and powder the gum animæ, ſarcocolla, and benzoin. Let all ſtand three or four days to diſſolve, ſhaking the glaſſes, &c. two or three times a day, and afterwards put them all together into a glazed veſſel, ſtirring them well, and ſtrain the liquor and gums gently, beginning with the gums, through a linen cloth. Then put it into a bottle, and let it ſtand a week before you uſe it, and pour off as much of the clear only, as you think ſufficient for preſent uſe.

The white Amber Varniſh, according to Mr. Boyle.] Take white roſin four drachms, melt it over the fire in a clean glazed pipkin; then put into it two ounces of the whiteſt amber you can get, finely powdered. This is to be put in by a little and little, gradually, keeping it ſtirring all the while with a ſmall ſtick, over a gentle fire, till it diſſolves, pouring in now and then a little oil of turpentine, as you find it growing ſtiff; and continue ſo to do till all your amber is melted. But great care muſt be taken not to ſet the houſe on fire, for the very vapours of the oil of turpentine will take fire by heat only; but if it ſhould happen ſo to do, immediately put a flat board or wet blanket over the fiery pot, and by keeping the air from it, you will put it out, or ſuffocate it. Therefore it will be beſt to melt the roſin, in a glaſs of cylindric figure, in a bed of hot ſand, after the glaſs has been well annealed, or warmed by degrees in the ſand, under which you muſt keep a gentle fire. When the varniſh has been thus made, pour it into a coarſe linen bag, and preſs it between two hot boards of oak or flat plates of iron; after which it may be uſed with any colours in painting, and alſo for varniſhing them over when painted. But for covering gold, you muſt uſe the following varniſh; mean time, it is to be obſerved, that when you have varniſhed with white varniſh, you may put the things varniſhed into a declining oven, which will harden the varniſh.

A hard Varniſh, that will bear the Muffle.] Take of colophony, an ounce; ſet it over the fire in a well glazed earthen veſſel, till it is melted; then by little and little, ſtrew in two ounces of powder of amber, keeping it ſtirring all the while with a ſtick; and when you perceive it begin to harden or reſiſt the ſtick, then put in a little turpentine oil, which will thin and ſoften it immediately: then put in two ounces of gum copal, finely powdered, ſprinkling it in as you did the amber, now and then pouring in a little oil of turpentine; and when it is done, ſtrain it as before directed. This is proper to varniſh over gold; and the things done with it muſt be ſet into a declining oven, three or four days ſucceſſively, and then it will reſiſt even the fire itſelf.

To make a Varniſh for Gold, or Metals made in imitation of Gold.] Take colophony, and, having melted it, put in two ounces of amber finely powdered, and ſome ſpirit of turpentine, and, as the amber thickens, keep it well ſtirring; then put in an ounce of gum elemi, well pulveriſed, and more ſpirit of turpentine; conſtantly ſtirring the liquor till all is well mixed and incorporated: but take care, however, to uſe as little turpentine as you can, becauſe, the thicker the varniſh is made, the harder it will be. Let this be done over a ſand heat, in an open glaſs; then ſtrain it, as is directed for the preceding varniſh. This varniſh is to be uſed alone, firſt warming the veſſels made of paper paſte; and lay it on with a painting bruſh before the fire, but not near, leſt the fire raiſe it into bliſters. After this has been done, harden it three ſeveral times in an oven; firſt with a ſlack heat, the next with a warmer, and the third with a very hot one; and the veſſels will look like poliſhed gold. And as for ſuch veſſels, &c. as ſhall be made with ſaw duſt and gums, the varniſh may be made of the ſame ingredients as above-mentioned, except the gum elemi; and this will dry in the ſun, or in a gentle warmth.

Laying on of Varniſhes.] 1. If you varniſh wood, let your wood be very ſmooth, cloſe grained, free from greaſe, and rubbed with ruſhes. 2. Lay on your colours as ſmooth as poſſible; and, if the varniſh has any bliſters in it, take them off by a poliſh of ruſhes. 3. While you are varniſhing, keep your work warm but not too hot. 4. In laying on your varniſh, begin in the middle, and ſtroke the bruſh to the outſide; then to another extreme part, and ſo on till all be covered; for if you begin at the edges, the bruſh will leave the blots there, and make the work unequal. 5. In fine works uſe the fineſt tripoli in poliſhing: do not poliſh it at one time only; but, after the firſt time, let it dry for two or three days, and poliſh it again for the laſt time. 6. In the firſt poliſhing you muſt uſe a good deal of tripoli, but in the next a very little will ſerve; when you have done, waſh off your tripoli with a ſponge and water; dry the varniſh with a dry linen rag; and clear the work, if a white ground, with oil and whiting; or if black, with oil and lamp-black.

Painting in Oil.] The whole ſecret of painting in oil conſiſts in grinding the colours with nut-oil, or linſeed-oil; but the manner of working is very different from that in freſco, or in water, by reaſon the oil does not dry near ſo faſt, which gives the painter an opportunity of touching and re-touching all the parts of his figures as often as he pleaſes; which in the other methods of painting is a thing impracticable. The figures done in oil, are alſo capable of more force and boldneſs; inſomuch, that the black becomes blacker, when ground with oil, than with water; beſides, all the colours mixing better together, makes the colouring the ſweeter, more delicate and agreeable, and gives an union and tenderneſs to the whole, inimitable in any of the other manners. Painting in oil is performed on canvas, on walls, wood, ſtone, and all ſorts of medals.

Painting on Cloth or Canvas is done as follows.] The canvas being ſtretched on a frame, give it a layer of ſize, or paſte-water, and then go over it with a pumice-ſtone, to ſmooth off the knots. By means of the ſize, the little threads and hairs are all laid cloſe on the cloth, and the little holes filled up, ſo that no colour can paſs through. When the cloth is dry, lay on oker in oil, which may be mixed with white-lead to make it dry the ſooner. When dry, go over it again with the pumice-ſtone, to make it ſmooth. After this a ſecond couch is ſometimes applied, compoſed of white-lead and a little charcoal-black, to render the ground of an aſh-colour. Others prime the canvas in the following manner; they firſt ſmooth the canvas with a pumice-ſtone, ſize it over with good ſize, and a little honey, and let it ſtand to dry; after which they lay it over with whiting and ſize, mixed with a little honey: the uſe of the honey is to prevent it from cracking, peeling, and breaking out; on this they firſt draw the picture with a coal, and then lay on the colours.

Painting on Walls.] When the wall is dry, they give it two or three waſhes with boiling oil, till the plaſter remains quite greaſy, and will imbibe no more; upon this they lay drying colours, ſuch as white chalk, red oaker, or other chalks beaten pretty ſtiff. When this couch or layer is well dried, the ſubject, or deſign, is ſketched out, and afterwards painted over, mixing a little varniſh with their colours, to ſave the varniſhing afterwards. In order the better to fortify the walls againſt moiſture, ſome cover it with a plaſter of lime, marble duſt, or cement made of beaten tiles ſoaked in linſeed oil; and at laſt prepare a compoſition of Greek pitch, maſtic, and thick varniſh boiled together, which they apply hot over the former plaſter; and when dry, lay on the colours as before. Others, in fine, make their plaſter with lime mortar, tile cement, and ſand; and this being dry, they apply another of lime, cement, and iron-ſcoriæ; which being well beaten, and incorporated with linſeed oil, and whites of eggs, make an excellent plaſter. When this is dry, the colours are laid on as before.

In Painting on Wood.] They uſually give their ground a couch or layer of white tempered with ſize, and then proceed as in painting on walls.

In Painting on Stone or Metals.] It is not neceſſary to lay them over with ſize, but only to add a ſlight couch of colours before the deſign is drawn on it: nor even is this done on ſtones, where you would have the ground appear, as in certain marbles and agates of extraordinary colours.

All the Colours uſed in Friſco.] Are good in oil, except white of lime and marble duſt. Thoſe chiefly uſed are white lead, or ceruſe, yellow and white maſticot, orpiment, vermillion, lacca, blue and green aſhes, verdigriſe, indigo, ſmalt, black-lead, ivory black, lamp-black, &c. As to oils, the beſt are thoſe of linſeed, walnuts, ſpike, and turpentine. The drying oils are nut-oil, boiled with litharge and ſandarach, or otherwiſe with ſpirit of wine, maſtic and gum-lacca. In the preparation of oil colours, care muſt be taken, that they be ground fine: that in putting them on a pallet, thoſe which will not dry of themſelves be mixed with drying oil, or other ingredients of a drying quality: and that the tinged colours be mixed in as ſmall quantities as poſſible. As to the ſituation of the colours, the pureſt and ſtrongeſt muſt be placed in the front of the piece, and the colouring varied according to the ſubject, time and place. If the ſubject be grave, melancholy, or terrible, the general teint of the colouring muſt incline to brown, and black, or red and gloomy: but it muſt be gay and pleaſant in ſubjects of joy and triumph.

Colour, in Dying, &c.] There are, in the art of dying, five colours, called ſimple, primary, or mother colours, from the mixture of which all other colours are formed: theſe are blue, yellow, brown, red, and black. Of theſe colours, variouſly mixed and combined, they form the following colours, panſy, blue and ſcarlet are formed: amaranth, violet, and panſy: from the ſame mixture of blues, crimſon, and red, are formed the columbine or dove colour, purple crimſon, amaranth, panſy, and crimſon violet. Here it is to be obſerved that they give the name crimſon to all colours made with cochineal.

Of blue and red madder is died purple, pepper colour, tan colour, and dry roſe colour.

The ſame blue with red half in grain, makes amaranth, tan colour, and dry roſe colour.

Blue and half red crimſon, compoſe amaranth, tan colour, dry roſe, a brown panſy, and ſun brown.

Blue and yellow, mixed together, compoſe a yellow green, ſpring green, graſs green, laurel green, brown green, dark green, as well as ſea green, parrot green, cabbage green, &c. Theſe three laſt colours are to be leſs boiled than the reſt. It is to be noted, that as to green, there is no ingredient or drug in nature that will dye it: but the ſtuffs are dyed twice, firſt in blue, then in yellow.

Blue and brown.] Theſe two colours are never mixed alone, but with the addition of red, either of madder or cochineal, they form ſeveral colours.

Red and yellow.] All the ſhades compoſed of theſe two colours, as gold, yellow, aurora, marygold, orange, nacarat, granat-flower, flame colour, &c. are made with yellow and red of madder, ſcarlet being leſs proper as well as too dear.

Red and brown.] Of theſe two colours are formed cinnamon colour, cheſnut, muſk, bear's hair, and even purple, if the red be of madder.

Yellow and brown.] The colours formed from theſe two, are all the ſhades of feuillemort, and hair colours. But this may be taken notice of, that though it be ſaid that there are no colours or ſhades made from ſuch and ſuch mixtures, it is not meant that none can be made, but that they are more eaſily formed from a mixture of other colours.

Dyeing in general.] The art of dyeing conſiſts in giving a laſting colour to ſilks, cloths, and other ſubſtances, whereby the beauty is much improved, and value enhanced: and this art chiefly depends on three things, viz. 1. Diſpoſing the ſurface of the ſtuffs to receive and retain the colours, which is performed by waſhing them in different lyes, digeſting, beating them, &c. in which human urine putrified, a ſharp ſalt of aſhes, divers ſoaps, and galls of animals, are of principal uſe; by means whereof the viſcuous gluten of the ſilk worms naturally adhering to their threads, is waſhed and cleanſed from them, and thus they become fitted gradually to imbibe the colours. By theſe alſo the greaſy foulneſs adhering to wool and flax is ſcoured off. 2. So to grind the colours, as that they may enter the body duly prepared, and preſerve their brightneſs undiminiſhed. 3. The third conſiſts in having beautiful colours.

According to Sir W. Petty's account of what is done in particular trades by the art of dyeing. 1. There is whitening of wax, and ſeveral ſorts of linen and cotton cloths, by the ſun, air, and reciprocal effuſions of water. 2. Colouring of wood and leather by lime, ſalt and liquors, as in ſtoves, canes, and marble leathers. 3. Colouring of paper, viz. the marbled paper, by diſtempering the colours with ox gall, and applying them upon a ſtiff gummed liquor. 4. Colouring, or rather diſcolouring, the colours of ſilks, tiffanies, &c. by brimſtone. 5. Colouring of ſeveral iron and copper works into black with oil. 6. Colouring of leather into gold colour, or rather ſilver leaves into gold by varniſhes, and in other caſes by urine and ſulphur. 7. Dyeing of marble and alabaſter, with heat and coloured oils. 8. Colouring ſilver into the braſs colour, with brimſtone or urine. 9 Colouring the barrels and locks of guns into blue and purple, with the temper of ſmall coal heat. 10. Colouring of glaſs (made of ſands, flints, &c.) as alſo of cryſtals and earthen ware, with the ruſts and ſolutions of metals. 11. The colouring of live hair, as in Poland, horſe and man's hair; as alſo the colouring of furs. 12. Enameling and annealing. 13. Applying colours, as in the printing of books and pictures, and as in making of playing cards, being each of them performed in a different way. 14. Gilding and tinning with mercury, block tin, ſal ammoniac. 15. Colouring of metals, as copper with calamy, into braſs, and with zink or ſpelter into a golden colour, or into a ſilver one with arſenick ; and of iron into a reſemblance of copper with Hungarian vitriol. 16. Making painters colours by preparing of earth, chalk, and ſlates ; as in umber, ochre, cullen earth, &c. as alſo out of ſcales of lead, as ceruſe and minium ; by ſublimates of mercury and brimſtone, as in vermillion ; by tinging whole earths variouſly, as in verditer, and ſome of the lakes ; by concrete juices, or fæculæ, as in gambogium, indigo, pinks, ſap green, and lakes ; as alſo by ruſts, as in verdigriſe, &c. 17. The applying theſe colours by the adheſion of ox gall, as in the marble paper aforeſaid ; or by gum water, as by limning ; or by clammy drying oils, ſuch as the oils of linſeed, nuts, &c. 18. The watering of tabbies. 19. The colouring of wool, linen, cotton, ſilk, hair, feathers, horn, leather, and the threads and webs of them with woods, roots, herbs, ſeeds, leaves, ſalts, limes, lixiviums, waters, heats, fermentations, macerations, and other great variety of management : an account of all which is a ſhort hiſtory of dyeing.

The Materials uſed in the Art of Dyeing.] Are iron and ſteel, or what is produced from them, in all true blacks, called Spaniſh blacks, though not in Flanders blacks, viz. they uſe copperas, ſteel filings, and ſlippe ; they alſo uſe pewter for bowe-dye ſcarlet, viz. they diſſolve bars of pewter in aquafortis; litharge is alſo uſed by ſome, though acknowledged by few to add weight to dyed ſilk. Antimony is much uſed to the ſame purpoſe. Arſenic is uſed in crimſon upon pretence of giving luſtre, although thoſe who pretend not to be wanting in giving luſtre to their ſilks, diſown its uſe. Verdigriſe is alſo uſed by linen dyers in their yellow and greeniſh colours ; though, of itſelf, it ſtrikes no deeper colour than that of a pale ſtraw. Of mineral ſalts uſed in dyeing, the chief is alum ; the true uſe whereof

ſeem

ſeems to be in regard to the fixation of colours. The next mineral ſalt is ſalt petre, not uſed by antient dyers, and but by few of the modern: nor is it yet uſed but to brighten colours, by back boiling of them, for which argol is more commonly uſed: lime is much uſed in working blue vats.

Of the animal family are uſed cochineal, urine of labouring men kept till it be ſtale and ſtinking, honey, yolks of eggs, and ox gall; the uſe of the urine is to ſcour, and help the fermenting and heating of woad; and is uſed alſo in blue vats inſtead of lime: it diſchargeth the yellow, and therefore is uſed to ſpend weld withal.

Dyers uſe two ſorts of water, viz. river and well water; the laſt, which is harſh, they uſe in reds and other colours wanting reſtringency, and in dyeing materials of the ſlacker contextures, as in callicoe, fuſtian, and the ſeveral ſpecies of cotton works; but it is not good for blues, and makes yellows and greens look ruſty.

River water is more fat and oily, and is therefore uſed in moſt caſes, and muſt be had in great quantities for waſhing and rinſing their cloths after dyeing. Water is called by dyers white liquor; but a mixture of one part bran, and five of river water boiled an hour and put into leaden ciſterns to ſettle, is what they call liquor abſolutely.

Gums have been uſed by dyers about ſilk, viz. gum arabic, tragacanth, maſtic, dragons blood. Theſe tend little to the tincture, any more than gum in writing ink, which only gives it a conſiſtence: ſo gum may give the ſilk a gloſſineſs; and laſtly, to increaſe the weight.

The three peculiar ingredients for black are copperas, filings of ſteel, and ſlippe; the reſtringent binding materials are alder-bark, pomegranate peels, walnut rinds and roots, oaken ſapling bark, and ſaw duſt of the ſame, crab tree bark, galls, and ſumac.

The ſalts are alum, ſalt petre, ſal ammoniac, pot aſhes, and ſtone lime; among which urine may be enumerated as a liquid ſalt.

The liquors are well and river water, urine, aquavitæ, vinegar, lemon juice, aquafortis, honey, and moloſſes.

Ingredients of another claſs are bran, wheaten flour, yolks of eggs, leaven, cummin ſeed, fenugreek ſeed, agaric and ſenna.

The ſmectics, or abſterſives, are fuller's earth, ſoap, linſeed oil, and ox gall.

The metals and minerals are pewter, verdigriſe, antimony, litharge, and arſenic.

The colourings are of three ſorts, viz. blue, yellow, and red; of which logwood, old fuſtic, indigo, and madder, are the chief.

General Obſervations upon Dyeing.] 1. All materials which of themſelves do give colour are either red, yellow, or blue; ſo that out of them, and the primitive fundamental colour white, all that great variety which we ſee in dyed ſtuffs doth ariſe.

2. That few of the colouring materials, as cochineal, ſoot, wood, wax, woad, &c. are in their outward and firſt appearance of the ſame colour, which by the ſlighteſt diſtempers and ſolutions in the weakeſt menſtrua, they dye upon cloth, ſilk, &c.

3. That many of them will not yield their colours without much grinding, ſteeping, boiling and fermenting, or corroſion by powerful menſtrua, as red-wood, weld, woad, arnotta, &c.

4. That many of them will of themſelves give no colouring at all, as copperas or galls, or with much diſadvantage, unleſs the cloth or other ſtuff to be dyed be as it were firſt covered, or incruſtated with ſome other matter, though colourleſs aforehand, as madder, weld, brazil, with alum.

5. That ſome of them, by the help of other colourleſs ingredients, do ſtrike different colours from what they would of themſelves, as cochineal, brazil, &c.

6. That ſome colours, as madder, indigo, and wood, by reiterated tinctures, will at laſt become black.

7. That although green be the moſt frequent and moſt common of natural colours, yet there is no ſimple ingredient now uſed alone to dye green with upon any material, ſap-green being the neareſt, which is uſed by country people.

8. There is no black thing in uſe which dyes black, though both the coal and ſoot of moſt things burnt or ſcorched be of that colour, and the blacker, by how much the matter before being burnt was whiter, as in ivory-black.

9, The tincture of ſome dyeing ſtuffs will fade even with lying, or with the air, or will ſtain with water only, but very much with urine, vinegar, &c.

10. Some of the dyeing materials are uſed to bind and ſtrengthen a colour; ſome to brighten it; ſome to give luſtre to the ſtuff; ſome to diſcharge and take off the colour, either in whole or in part; and ſome out of fraud, to make the material dyed, if coſtly, heavier.

11. That ſome dyeing ingredients, or drugs, by the coarſeneſs of their bodies, make the thread of the dyed ſtuff ſeem coarſer; and ſome, by ſhrinking them, ſmaller; and ſome, by ſmoothing them, finer.

12. Many of the ſame colours are dyed upon ſeveral ſtuffs with ſeveral materials, as red-wood is uſed in cloth, not in ſilks; arnotta in ſilks, not in cloth, and may be dyed at ſeveral prices.

13. That ſcouring and waſhing of ſtuffs to be dyed, is done with ſpecial materials, as ſometimes with ox galls, ſometimes with fullers-earth, and ſometimes ſoap; this latter being, in ſome caſes, pernicious, where pot-aſhes will ſtain, or alter the colour.

14. Where great quantities of ſtuffs are to be dyed together, or where they are to be done with any ſpeed, and where the pieces are very long, broad, thick, or otherwiſe, they are to be differently handled, both in reſpect to the veſſels and ingredients.

15. In ſome colours and ſtuffs the tingent liquor muſt be boiling, in other caſes blood warm, and in ſome it may be cold.

16. Some tingent liquors are fitted for uſe by long keeping, and in ſome the virtues wear away by the keeping.

17. Some colours or ſtuffs are beſt dyed by reiterated dippings in the ſame liquor, ſome by continuing longer, and others a leſſer time therein.

18. In ſome caſes, the matter of the veſſel wherein the liquors are heated, and the tincture prepared, muſt be regarded, as the kettles muſt be pewter for bow-dye.

19. There is little reckoning made how much liquor is uſed in proportion to the dyeing drugs, it being rather adjuſted to the bulk of the ſtuffs, as the veſſels are to their breadth; the quantity of dyeing drugs being proportioned both to the colour, higher or lower, and to the ſtuffs: as likewiſe the ſalts are to the dyeing drugs. Concerning the weight that colours give to ſilk, (in which it is moſt taken notice of, being ſold by weight, and a commodity of great price) it is obſerved that one pound of raw ſilk loſeth four ounces by waſhing out the gums, and the natural ſordes. That the ſame ſcoured ſilk may be raiſed to above thirty ounces from the remaining twelve, if it be dyed black with ſome materials.

Of a thing very uſeful in dyeing, eſpecially of black, nothing increaſes weight ſo much as galls, by which black ſilks are reſtored to as much weight as they loſt by waſhing out their gum: nor is it counted extraordinary that blacks ſhould gain about four or ſix ounces in the dying, upon each pound.

Next to galls, old fuſtic encreaſes the weight $1\frac{1}{2}$ in 12; madder, about one ounce; weld, half an ounce. The blue vats in deep blues of the 5th ſtall, give no conſiderable weight; neither doth logwood, cochineal, nor even copperas, where galls are not: ſlippe adds much to the weight, and giveth a deeper black than copperas itſelf, which is a good excuſe for the dyers that uſe it.

Dying of wool and woollen manufactures.] For black in woollen manufactures, it is begun with a ſtrong decoction of woad and indigo, that communicate a deep blue; after which the ſtuffs being boiled with alum and tartar, or pot-aſh, are to be maddered with common madder, then dyed black with Aleppo galls, copperas, and ſumac, and finiſhed by back boiling in weld. Wools for tapeſtry are only to be woaded, and then put in black. For ſcarlet, wool and woollen manufactures are dyed with kermes and cochineal, with which may alſo be uſed agaric and arſenic. Crimſon ſcarlet is dyed with cochineal, maſtic, aquafortis, ſal ammoniac, ſublimate, and ſpirit of wine. Violet ſcarlet, purple, amaranth, and panſy ſcarlets, are given with woad, cochineal, indigo, braziletto, brazil, and orchal. Common reds are given with pure madder, without any other ingredient. Crimſon reds, carnations, flame and peach colours, are given, according to their ſeveral hues, with cochineal, maſtic, without madder, or the like. Crimſon red is prepared with Roman alum with cochineal. Orange aurora, brick colour, and onion peel colour, are dyed with woad and madder, mixed according to their ſeveral ſhades. For blues, the dark are dyed with a ſtrong tincture of woad; the brighter with the ſame liquor, as it weakens in working. Dark browns, minims, and tan colours, are given with woad, weaker in decoction than for black, with alum and pot-aſhes, after which they are maddered higher than black: for tan colours, a little cochineal is added. Pearl colours are given with galls and copperas; ſome are begun with walnut tree roots, and finiſhed with the former; though to make them more uſeful, they generally dip them in a weak tincture of cochineal. Greens are begun with woad, and finiſhed with weld. Pale yellows, lemon colour, and ſulphur colour, are given with weld alone. Olive colours of all degrees are firſt put in green, and taken down with ſoot, more or leſs, according to the ſhade that is required. Feulemort, hair colour, muſk, and cinnamon colour, are dyed with weld and madder. Nacarat, or bright orange, is given with weld and goats hair boiled with pot-aſhes.

Dyeing of ſilks.] This is begun by boiling them in ſoap, &c. then ſcouring and waſhing them in water, and ſteeping them in cold alum water. For crimſon, they are ſcoured a ſecond time before they are put into the cochineal vat. Red crimſon is given with pure cochineal, maſtic, adding galls, turmeric, arſenic, and tartar, all mixed in a copper of fair water almoſt boiling: with theſe the ſilk is to be boiled an hour and a half, after which it is allowed to ſtand in the liquor till next day. Violet crimſon is given with pure cochineal, arſenic, tartar and galls; but the galls in leſs proportion than in the former: when taken out, it is waſhed and put in a vat of indigo. Cinnamon crimſon is begun like the violet, but finiſhed by back boiling, if too bright with copperas, and if dark, with a dip of indigo. Light blues are given in a back of indigo. Sky blues are begun with orchal, and finiſhed with indigo. For citron colours, the ſilk is firſt alumed, then welded with indigo. Pale yellows, after aluming, are dyed in weld alone. Pale and brown aurora's, after aluming, are welded ſtrongly, then taken down with rocou and diſſolved with pot-aſhes. Flame colour is begun with rocou, then alumed, and afterwards dipped in a vat or two of brazil. Carnation and roſe colours are firſt alumed, then dipt in brazil. Cinnamon colour, after aluming is dipt in brazil, and braziletto. Lead colour is given with fuſtic, or with weld braziletto, galls and copperas. Black ſilks of the coarſer ſort, are begun by ſcouring them with ſoap, as for other colours; after which they are waſhed out, wrung, and boiled an hour in old galls, where they are ſuffered to ſtand a day or two: then they are waſhed again with fair water, wrung, and put into another vat of new galls; afterwards waſhed again, and wrung, and finiſhed in a vat of black. Fine black ſilks are only put once into galls of the new and fine ſort, that has only boiled an hour: then the ſilks are waſhed, wrung out, and dipped thrice in black, and afterwards taken down by back boiling with ſoap.

The dying of thread.] This is begun by ſcouring it in a lye of good aſhes: afterwards it is wrung, rinſed out in river water, and wrung again. A bright blue is given with braziletto and indigo: bright green is firſt dyed blue, then back-boiled with braziletto and verditer, and laſtly woaded. A dark green is given like the former, only darkening more before woading. Lemon and pale yellow is given with weld mixed with rocou. Orange Iſabella, with fuſtic, weld, and rocou. Red, both bright and dark, with flame-colour, &c. are given with brazil, either alone, or with a mixture of rocou. Violet, dry roſe, and amaranth, are given with brazil, taken down with indigo. Feulemort and olive-colour are given with galls and copperas, taken down with weld, rocou, or fuſtic. Black is given with galls and copperas, taken down and finiſhed with braziletto-wood.

A preparation for curing wens, by which a perſon has acquired a conſiderable fortune, and much reputation.] Take a quantity of ſnow, that has been collected in the coldeſt ſeaſon, ſufficient to produce a quart of water, when melted: add to this one ounce of Roman vitriol, and one drachm of camphire; theſe are to be put into the ſnow water, after this is made warm over a moderate fire; let it ſtand till fine; and then add thereto four ounces of ſpirits of wine, in which one drachm of the golden or July butterflies have been infuſed. Theſe inſects are to be dried and powdered, before they are put into the ſpirits of wine; and care muſt be taken to procure the right ſort, as it appears that very much depends on them. They are to be had, in moſt places where flowers abound, about Midſummer; and are then in their prime. With this liquid the wens are to be rubbed night and morning for a month ſucceſſively, and ſucceſs will attend it, with very little pain or trouble to the patient. Snow, when uſed alone, is ſaid to have many valuable properties; as may be ſeen at large in Bartholin's Treatiſe De nivis uſu medico. It has been obſerved, in the cure of wens, that if the patient anoint the part with oil of ſweet almonds three or four days before uſing the above remedy, it will greatly forward the cure.

The moſt reaſonable and certain method of curing the tooth-ache.] The tooth-ache is a very painful diſorder, cauſed by an impure ſerum which corrodes and rends the ligaments and nervo glandulous coats, by which the teeth are kept firm in their ſockets: its ſeat may alſo be in the cavity or internal parts of the teeth themſelves. The whole intention of cure, in this diſorder, conſiſts in deriving and diverting the impure ſcorbutic ſerum from the head, and then carrying it off by proper emunctories. If the patient is plethoric, or full of blood, phlebotomy in the foot will be proper, to derive the humours from the head. Sudorific remedies are alſo proper, and often do great ſervice. Allen adviſes to rub the tooth that is painful, with the root of the iris lutea, or the yellow fleur-de-luce; or a pill may be made of equal quantities of camphor or opium, and put into the hollow tooth. A few grains of paradiſe bruiſed, and then put in a piece of fine linen cloth, and held to the acheing tooth, has often given relief in a few minutes after being put into the mouth. And the following powder is in great eſteem, viz. Pumice-ſtone, ſcuttle-fiſh bone, of each one ounce; tartar of vitriol, maſtic, two drachms each; muſk, one ſcruple, oil of rhodium, three drops; mix all into a fine powder. This whitens the teeth, ſweetens the breath, hardens the gums, is good againſt the ſcurvy in them, and cures the tooth-ache, by rubbing the teeth and gums therewith.

Cure for the bite of a mad dog.] An eaſy remedy for the bite of mad dogs has been communicated by M. Sydow, of Stolzefelde, near Soldin. It is the matriſylva, well known to all apothecaries. Ten perſons have been perfectly cured by it, beſides above an hundred head of cattle. It has ſucceeded with ſwine, and even with dogs themſelves. It may be given to any perſon, either green or dry, in milk, or in the manner of tea, twice a day. No regular doſe is neceſſary to be obſerved.

Method of colouring brandy.] All brandies, when firſt made, are as clear as water, and do grow higher coloured by long keeping; however, they are artfully made of any colour ſeveral ways. To make a light ſtraw colour, uſe turmeric or a little treacle: but the beſt way is to give it a colour or tincture with a little burnt ſugar made to a conſiſtence; or ſyrup of elder-berries may be uſed, which gives an admirable colour, and may be made deeper or lighter, according to the quantity you put in.

The way to make ſealing wafers.] Take very fine flour, mix it with glair of eggs, iſinglaſs, and a little yeaſt; mingle the materials; beat them well together, ſpread the batter, being made thin with gum-water, on even tin plates, and dry them in a ſtove; then cut them out for uſe. You may make them of what colours you pleaſe, by tinging the paſte with brazil or vermillion for red; indigo or verditer, &c. for blue.

Sympathetic powder.] The compoſition of the famous ſympathetic powder, uſed at Goſſilaer by the miners in all their wounds, is this. Take of green vitriol, eight ounces; of gum tragacanth, reduced to an impalpable powder, one ounce; mix theſe together, and let a ſmall quantity of the powder be ſprinkled on the wound, and it immediately ſtops bleeding. The vitriol is to be calcined to whiteneſs in the ſun, before it is mixed with the gum.

The virtues of a cruſt of bread, eat in a morning faſting; publiſhed by an eminent phyſician.] In the above treatiſe, (which ſells for 1s. 7½d.) the author only aſſerts, that a great many obſtinate diſorders, are cured by this ſimple remedy; and gives many inſtances of its great efficacy in the following caſes, viz. king's evil, cachexies, ſcurvies, leproſies, rheumatic complaints, &c. &c. The author orders about half an ounce of hard cruſt, or ſea-biſcuit, to be eat every morning faſting, for five or ſix weeks; and nothing to be taken after it in leſs than three or four hours.

Conſtruction of almanacks.] The firſt thing to be done, is to compute the ſun's and moon's place for each day of the year, or it may be taken from ſome ephemerides, and entered in the almanack; next, find the dominical letter; and, by means thereof, diſtribute the calandar into weeks: then having computed the time of Eaſter, by it fix the other moveable feaſts; adding the immoveable ones, with the names of the martyrs, the riſing and ſetting of each luminary, the length of day and night, the aſpects of the planets, the phaſes of the moon, and the ſun's entrance into the cardinal points of the ecliptic; that is, the two æquinoxes and ſolſtices. And theſe are the principal contents of almanacks; beſides which there are others of a political nature, and conſequently different in different countries, as the birth days and coronations of princes, tables of intereſt, &c. As to the antiquity of almanacks, Ducange informs us, that the Egyptian aſtrologers, long before the Arabians, uſed the term almanack, and almenachica deſcriptio, for their monthly productions. Be that as it will, Regiomontanus is allowed to have been the firſt who reduced almanacks to their preſent form. On the whole, there appears to be no myſtery, or even difficulty, in almanack making, provided tables of the heavenly motions be not wanting.

A neceſſary POCKET ALMANACK, *by which the day of the month is known, at firſt view, from the preſent time, to the year of our lord,* 1831.] Under the word years, find the year; above which is the dominical letter for that year.——Then, againſt the month, in the other table, find the ſame letter, over which are placed the days of the month for every Sunday of that month.——Every blank ſpace ſhews the year following to be leap-year.——N. B. In every leap-year for January and February, uſe the letter above the blank ſpace before for that year.

YEARS.

YEARS.

A	G	F	E	D	C	B
1758	59		60	61	62	63
	64	65	66	67		68
69	70	71		72	73	74
75		76	77	78	79	
80	81	82	83		84	85
86	87		88	98	90	91
	92	93	94	95		96
97	98	99	1800	1	2	3
	4	5	6	7		8
9	10	11		12	1	14
15		16	17	18	19	
20	21	22	23		24	25
26	27		28	29	30	31

SUNDAYS.

	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
Jan. Oct.	A	B	C	D	E	F	G
May.	B	C	D	E	F	G	A
Aug.	C	D	E	F	G	A	B
Fb. Mar Nov.	D	E	F	G	A	B	C
June.	E	F	G	A	B	C	D
Sep. De	F	G	A	B	C	D	E
Ap. Jul	G	A	B	C	D	E	F

The COURT GAMESTER : *or, the Lady and Gentleman inſtructed in the polite games of* OMBRE, QUADRILLE, *and* PICQUET.

Of Ombre.] This is a celebrated Game at Cards, borrowed from the Spaniards, and played by two, by three, or by five perſons, but generally by three. When three play at this game, nine cards are dealt to each party; the whole ombre-pack being only forty, becauſe the eights, nines, and tens are thrown out of the pack. There are two ſorts of counters for ſtakes, the greater and the leſſer; the laſt having the ſame proportion to the other, as a penny to a ſhilling: of the greater counters each man ſtakes one for the game; and one of the leſſer for paſſing for the hand when eldeſt, and for every card taken in. As to the order and the value of the cards, the ace of ſpades, called ſpadillo, is always the higheſt trump, in whatſoever ſuit the trump be; the manille, or black duce, is the ſecond; and the baſto, or ace of clubs, is always the third: the next in order is the king, the queen, the knave, the ſeven, the ſix, the five, four, and three. Of the black, there are eleven trumps: of the red, twelve. The leaſt ſmall cards of the red are always the beſt, and the moſt of the black; except the duce and red ſeven, both of which are called the manilles, and are always ſecond when the red is a trump. The red ace, when a trump, enters into the fourth place, and is called punto, otherwiſe it is only called an ace. The three principal cards are called matadores, which have this privilege, that they are not obliged to attend an inferior trump when it leads; but, for want of a ſmall trump, the perſon may renounce trumps, and play any other card; and when theſe are all in the ſame hand, the others pay three of the greater counters a piece; and with theſe three for a foundation, he may count as many matadores as he has cards in an uninterrupted ſeries of trumps; for all which the others are to pay one counter a piece. He who hath the firſt hand is called ombre, and has his choice of playing the game, of naming the trump, and of taking in as many and as few cards as he pleaſes; and after him the ſecond, &c. But if he does not name the trump before he look on the cards he has taken in, any other may prevent him, by naming what trump he pleaſes. He that has the firſt hand, ſhould neither take in, nor play, unleſs he has at leaſt three ſure tricks in his hand; for, as he wins the game, who wins moſt tricks, he that can win five of the nine, has a ſure game: which is alſo the caſe if he wins four, and can ſo divide the tricks as that one perſon may win two, and the other three.

If a perſon plays without diſcarding or changing any cards, this is called playing ſans prendre; and if another wins more tricks than he, he is ſaid to win codille. The over ſights in the courſe of the game are called beaſts. And if the ombre wins all the nine tricks, it is called winning the vole.

In ombre by five, which many, on account of its not requiring ſo cloſe an attention, prefer to that by three, only eight cards a piece are dealt; and five tricks muſt be won, otherwiſe the ombre is beaſted. Here, the perſon who undertakes the game, after naming the trump, calls a king to his aſſiſtance: upon which the perſon in whoſe hand the king is, without diſcovering himſelf, is to aſſiſt him as a partner, and to ſhare his fate. If, between both, they can make five tricks, the ombre wins two counters, and the auxiliary king only one: but when the counters are even, they divide them equally. If the ombre venture the game without calling in any king, this too is called ſans prendre: in which caſe the other four are all againſt him, and he muſt win five tricks alone, or be beaſted. The reſt is much the ſame as by three.

Of Quadrille.] This game is ſometimes called ombre by four, which chiefly differs from ombre by three, in being played by four perſons, and having all the forty cards dealt out to each perſon, at ten each.

The general law of this game. 1. It is not permitted to deal the cards any otherwiſe than four by three, the dealer being at liberty to begin with which of thoſe numbers he pleaſes. 2. If he who plays either ſans prendre, or calling a king, names a trump of a different ſuit from that his game is in, or names two ſeveral ſuits, that which he firſt named muſt be the trump. 3. He who plays muſt name the trump by its proper name, as he likewiſe muſt the king he calls. 4. He who has ſaid I paſs, muſt not be again admitted to play, except he plays by force, upon account of his having ſpadille. 5. He who has aſked the queſtion, and has leave given him to play, is obliged to do it: but he muſt not play ſans prendre except he is forced to do it. 6. He who has four kings may call the queen of either of the kings. 7. Neither the king nor queen of the ſuit which is trumps, muſt be called. 8. He who has one, or ſeveral kings, may call any king he has in hand: in ſuch caſe, if he wins, he alone muſt make ſix tricks: if he wins it is all his own, and if he loſes he pays all by himſelf 9. Every one ought to play in his turn, but for having done otherwiſe no one muſt be beaſted. 10. He, however, whoſe turn it is not to play, having in his hand the king the ombre has called, and ſhall trump about with either ſpadille, manille, or baſto, or ſhall even play down the king that was called to give notice of his being the friend, muſt not pretend to undertake the vole; nay, he muſt be condemned to be beaſted if it appears that he did it with any fraudulent deſign. 11. He who has drawn a card from his game, and preſented it openly in order to play it, is obliged ſo to do, if his retaining it may be either prejudicial to the game, or give any intimation to the friend, eſpecially if the card is a matadore: but he who plays ſans prendre, or calls his own king, is not ſubject to this law. 12. None ought to look upon the tricks, nor to count aloud what has been played, except when it is his turn to play, but to let every one reckon for himſelf. 13. He who inſtead of turning up the tricks before any one of his players, ſhall turn up and diſcover his game, muſt be equally beaſted with him whoſe cards he had ſo diſcovered, the one paying one half and the other the like. 14. He who renounces muſt be beaſted as many times as he has ſo done: but if the cards are mixed he is to pay but one beaſt. 15. If the renounce prejudices the game, and the deal is not played out, every one may take up his cards, beginning at the trick where the renounce was made, and play them over again. 16. He who ſhews the game is out, muſt be beaſted, except he plays ſans prendre. 17. None of the three matadores can be commanded down by an inferior trump. 18. If he who plays ſans prendre with the matadores in his hand, demands only one of them, he muſt receive only that he mentioned. 19. He who inſtead of ſans prendre ſhall demand matadores, not having them: or he who ſhall demand ſans prendre inſtead of matadores, cannot compel the players to pay him what is really his due. 20. Matadores are only paid when they are in the hands of the ombre, or of the king his ally, whether all in one hand or ſeparately in both. 21. He who undertakes the vole and does not make it, muſt pay as much as he would have received had he won it. 22. He who plays and does not make three tricks is to be beaſted alone, and muſt pay all that is to be paid: and if he makes no tricks at all, he muſt alſo pay to his two adverſaries the vole, but not to his friend.

Of Picquet.] This is a celebrated game at cards played between two perſons, with only thirty-two cards: all the duces, threes, fours, fives, and ſixes being ſet aſide.

In playing at this game twelve cards are dealt to each, and the reſt laid on the table: when, if one of the gameſters find he has not a court card in his hand, he is to declare that he has carte blanche, and tell how many cards he will lay out, and deſire the other to diſcard, that he may ſhew his game, and ſatisfy his antagoniſt, that the carte blanche is real; for which he reckons ten. And here the eldeſt hand may take in three, four, or five, diſcarding as many of his own for them, after which the other may take in all the remainder if he pleaſes. After diſcarding, the eldeſt hand examines what ſuit he has moſt cards of: and reckoning how many points he has in that ſuit, if the other has not ſo many in that, or any other ſuit, he reckons one for every ten in that ſuit, and he who thus reckons moſt is thus ſaid to win the point. It is to be obſerved, that in thus reckoning the cards, every card goes for the number it bears; as a ten for ten: only all court cards go for ten, and the ace for eleven, and the uſual game is one hundred up. The point being over, each examines what ſequences he has of the ſame ſuit, viz. how many tierces, or ſequences of three cards: quarts, or ſequences of four cards: quintes, or ſequences of five cards, &c. he has. Theſe ſeveral ſequences are diſtinguiſhed in dignity by the cards they begin from: thus, ace, king, and queen, are ſtiled tierce major; king, queen, and knave, tierce to a king: knave, ten, and nine, tierce to a knave: and the beſt tierce, quarte, or quinte prevails, ſo as to make all the others in that hand good, and to deſtroy all thoſe in the other hand. In like manner a quarte in one hand ſets aſide a tierce in the other.

The ſequences over, they proceed to examine how many aces, kings, queens, knaves, and tens each holds; reckoning for every three of any ſort, three; but here too, as in ſequences, he that with the ſame number of threes or fours, has one that is higher than any the other has, makes his own good, and ſets aſide all his adverſary's: but four of any ſort, which is called a quatorze, becauſe fourteen are reckoned for it, always ſet aſide three.

The game in hand being thus reckoned, the eldeſt proceeds to play, reckoning one for every card he plays above nine, while the other follows him in the ſuit: but unleſs a card be won by one above nine, except it be the laſt trick, nothing is reckoned for it. The cards being played out, he that has moſt tricks reckons ten for winning the cards: but if they have tricks alike, neither reckons any thing. If one of them wins all the tricks, inſtead of ten, which is his right for winning the cards, he reckons forty, and this is called capot.

The deal being finiſhed, each perſon ſets up his game: they then proceed to deal again as before, cutting afreſh each time for the deal: if both parties are within a few points of being up, the carte blanche is the firſt that reckons, then the point, then the ſequences, then the quatorzes, then the tierces, and then the tenth cards. He then reckons thirty in hand by carte blanche, points, quintes, &c. without playing, before the other has reckoned any thing, reckons ninety for them, and this is called a repike; and if he reckons above thirty, he reckons ſo many above ninety. If he can make up thirty, part in hand, and part in play, before the other has told any thing, he reckons for them ſixty; and this is called a pique, whence the name of the game. M. de Moivre, in his doctrine of chances, has reſolved, among others, the following problems: 1. To find, at picquet, the probability which the dealer has for taking one ace or more in three cards, he having none in his hands. He concludes, from his computation, that it is 29 to 28 that the dealer takes one ace or more. 2 To find, at picquet, the probability which the eldeſt has of taking an ace or more in five cards, he having no ace in his hands. Anſwer; 232 to 91, or 5 to 2, nearly. 3. To find, at picquet, the probability which the eldeſt has of taking both an ace and a king in five cards, he having none in his hand. Anſwer; the odds againſt the eldeſt hand taking an ace and a king are 331 to 315, or 21 to 20 nearly. 4. To find, at picquet, the probability of having twelve cards dealt to, without king, queen, or knave: which caſe is commonly called carte blanches. Anſwer; the odds againſt chartes blanches are 323 to 578956, or 1791 to 1 nearly. 5. To find how many different ſets eſſentially different from one another, one may have at picquet before taken in. Anſwer; 28,967,278. This number falls ſhort of the ſum of all the diſtinct combinations, whereby twelve cards may be taken out of 32, this number being 225,792,840; but it ought to be conſidered, that in that number ſeveral ſets of the ſame import, but differing in ſuit, might be taken, which would not introduce an eſſential difference among the ſets.

Of Whiſt.] This is a well known game at cards; ſo called from the ſilence obſerved during the play, which is like that of Honours and Ruff. However, as there are many ways of cheating at this game, we ſhall mention a few, to put the unwary upon their guard. Some by winking, ſhutting their eyes, placing their fingers, or other ſigns, find means to let their partners know what honours they have got: others have a way of cutting honours either to their partners or themſelves; and the dealer is often crafty enough to conceal ſome honours for himſelf: but the beſt way of rooking is by means of breef cards: for if the honours are ſomewhat broader than the reſt, your adverſary muſt always cut you an honour.

Of Honours and Ruff.] At this game all the duces are kept in the pack, by which means, as four play (two being of a ſide) twelve are dealt to each perſon, and there remain four for the ſtock, whereof the uppermoſt is turned up for trump; he that hath the ace of that ſuit, ruffs; that is, he takes in thoſe four cards, and lays out four others in their place. The honours are the ace, king, queen, and knave; and he that hath three of theſe honours in his own hand, his partner not having the fourth, ſets up eight by cards, that is, two tricks; if he hath all four, then ſixteen or four tricks; and here obſerve, that it is all one, if the two partners make three or four honours between them, as if one had them. If the honours are equally divided among the players, they then ſay, *honours are ſplit.* If either ſide are at eight groats, any of the partners has the benefit of calling, *can you?* provided he has two honours in his hand; and if his partner anſwers *one,* the game is up, which is nine in all: if he has more than two, he ſhews them directly, which anſwers the ſame purpoſe. However, if a trick be played before any of the gameſters call, they loſe the benefit of *can you,* for that deal. As to the value of the cards, the ace is the higheſt, then the king, queen, knave, ten, nine, &c. in order: but the leaſt trump will win the higheſt card of any other ſuit. Play your cards ſuitable to thoſe in your partner's hand; and have a ſpecial eye to what cards are played out; by which means you will know what to play, if you lead, or trump ſecurely and advantageouſly.

To make artificial fleſh.] Take crumbs of the beſt wheaten bread, as ſoon as it comes forth out of the oven, being very hot, and as much as you pleaſe; put it into a bolt head of glaſs (without any other moiſture than what is in the bread itſelf) which preſently ſeal up hermetically. Then ſet it in digeſtion in a temperate balneo, the ſpace of two months, and it will be turned into a fibrous fleſh. This being exalted to a higher perfection by the rules of art, you may eaſily ſee how great a nouriſher and reſtorative wheat is, and what an excellent medicine may be made of it.

To make an artificial Malaga wine.] Take a wine veſſel well hoopt with iron hoops, and one end open, to which a cloſe cover muſt be fitted to take on and off at pleaſure, ſet it in a warm place, fill it full of fair water, to every gallon of which put two pounds of Malaga raiſins, firſt bruiſed in a ſtone mortar; and to every twenty gallons of water a good handful of calx vive: cover the veſſel cloſe, and keep it warm with cloths: let it ſtand four or five days to work: then ſee if the raiſins be riſen up, and beat them down, and cover it again as before, beating them down every fourth or fifth day for three or four weeks: then put a tap in, four inches above the bottom, and ſee if it taſtes like wine; if not, let it ſtand a while longer; after which draw it off into another wine veſſel, and to every twenty gallons put a pint or quart of the beſt ſpirit of wine (as you would have it in ſtrength) two new laid eggs, and a quart or better of Alicant well beaten together. Let it ſtand in a cellar as other wine till it is fine, and fit to be drank.

To make an artificial claret.] Take water, ſix gallons: choice cider, two gallons: beſt Malaga raiſins bruiſed, eight pounds: mix and let them ſtand all in a warm place fourteen days, ſtirring them well once every day. Then preſs out the raiſins, and put the liquor into the veſſel again, to which add juice of raſpberries a quart: juice of black cherries a pint: juice of black berries a pint and a half: cover this liquor with bread ſpread thick with ſtrong muſtard, the muſtard ſide being downwards, and ſo let it work by the fire three or four days; after which tun it up, let it ſtand a week, and bottle it up, ſo will it become a very briſk and pleaſant drink, and far better and wholeſomer than our common claret.

To make an artificial malmſey.] Take eight gallons of ſpring water: Engliſh honey two gallons: make them boil over a gentle fire for an hour: take it off, and when it is cold, put it into a runlet, hanging in the veſſel a bag of ſpices, and ſet it in the cellar for half a year, at the end of which you may drink it.

To make raſpberry wine.] Take Canary a gallon: raſpberries two gallons: mix and digeſt twenty-four hours: ſtrain them out, and add raiſins of the ſun ſtoned three pounds: digeſt again four or five days, ſometimes ſtirring them together: then pour off the cleareſt, and put it up into bottles, which put into a cold place: if it be not ſweet enough you may dulcify it with ſugar.

Another way to do the ſame.] Take juice of raſpberries, bottle it up cloſe, and ſet it in a cellar, and it will become clear, and keep all the year long, and be very fragrant; a few ſpoonfuls of this put into a pint of wine ſweetened with ſugar, will give it a full taſte of the berry: two or thee ounces of the ſyrup of the juice will do the ſame.

To purify oil olive, that it may be eaten with pleaſure.] Take fair water two quarts, oil olive a pint: mix, and ſhake them well together for a quarter of an hour in a glaſs; then ſeparate the water from the oil with a ſeparating funnel. Do this four or five times or more as you ſee occaſion, till the oil becomes very pure; and the laſt time waſh it with roſe-water, then hang in the midſt of the oil a coarſe bag full of bruiſed nutmegs, cloves, and cinnamon, ſo will you give it an excellent taſte.

To purify butter, and make it of a moſt ſweet taſte.] Melt butter with a ſlow fire in a well glazed earthen veſſel, which put to fair water, working them well together, and when it is cold take away the curds and the whey at the bottom. Do it again the ſecond time, and if you pleaſe, the third time in roſe-water, always working them very well together. The butter thus clarified will be as ſweet in taſte, as the marrow of any beaſt, and keep a long time, by reaſon of the great impurity which is removed by this means, the droſs being near a quarter of the whole.

To make ſage, parſley, or pennyroyal butter.] When the butter is newly made, and well wrought from its water, milk, and wheyiſh part, mix therewith a little oil of ſage or parſley, ſo much till the butter is ſtrong enough in taſte to your liking, and then temper them well together; this will excuſe you from eating the plants therewith; and if you do this with the aforeſaid clarified butter, it will be far better, and a moſt admirable rarity.

To purify and refine ſugar.] In a ſtrong lixivium of calx vive diſſolve as much coarſe ſugar as it will bear, adding to every quart of liquor, two whites of eggs, beaten into glair, ſtir them well together, and make them boil a little, taking off the ſkum, as long as any will ariſe; then paſs all through a great woollen cloth bag, then boil the liquor again ſo long till being dropt upon a cold plate, being cold, it is as hard as ſalt; this done, put it out into pots or moulds for that purpoſe, having a hole in the narrower end thereof, which muſt be ſtopt for one night, afterwards being opened, the molleſſes or treacle will drop forth; then cover the ends of the pots with potters clay, and as that clay ſinks down, by reaſon of the ſinking of the ſugar, fill them up with more clay, doing thus, till the ſugar will ſink no more. Laſtly take it out, and being hard and dry, bind it up in papers.

To make a vegetable grow more glorious than its ſpecies.] Reduce any vegetable into its three firſt principles, and then join them together again, being well purified; put the ſame into a rich earth, and you

you ſhall have it produce a vegetable far more glorious, than any of its ſpecies.

To make a plant grow in two or three hours.] Take aſhes of moſs, which moiſten with the juice of an old dunghil (being preſſed out and ſtrained) then dry them a little, and moiſten them as before; do this four or five times; put this mixture not being very dry, nor very moiſt into an earthen veſſel, and in it ſet ſeeds of lettuce, purſlane, or parſley, (for they will grow ſooner than other ſeeds) being firſt impregnated with the eſſence of a vegetable of its own ſpecies (ſome ſay the juice of the ſame plant, but eſpecially the ſpirit will do inſtead of the eſſence;) till they begin to ſprout forth; which then put into the ſaid earth, with that end upwards which ſprings. Put the veſſel into a gentle heat, and when it begins to dry, moiſten it with the ſaid juice of dung: thus may you have a ſalad while ſupper is making ready.

To reduce a whole vegetable into a liquor which may be called the eſſence thereof.] Take the whole plant with flowers and roots, bruiſe them in a mortar, put all into a large glaſs veſſel, (but a wooden one is better) ſo that two of three parts may be empty; cover it exceeding cloſe, and let it ſtand in putrefaction in a moderate heat for a year, and it will all be turned into a water.

To make the lively form and idea of any plant appear in a glaſs.] Take the former water, of vegetable, diſtil it in a good glaſs in aſhes, and there will come forth a water and oil, and in the upper part of the veſſel a volatile ſalt; the oil ſeparate and keep by itſelf; with the water diſſolve the volatile ſalt, and purify it by filtering and coagulating. This purified ſalt imbibe with the ſaid oil until it will imbibe no more; digeſt them well together for a month in a veſſel hermetically ſealed; ſo will you have a moſt ſubtil eſſence, which being held over a gentle heat, or the flame of a candle, by which means it may be made hot, you will ſee the fine ſubſtance (which is like impalpable aſhes or ſalt) ſend forth from the bottom of the glaſs, the manifeſt form and idea of the vegetable, vegetating and growing by little and little, and putting on ſo fully the form of ſtalks, leaves, and flowers, in ſuch perfect and natural wiſe, that one would believe the ſame to be real; when as in truth it is the ſpiritual idea, ariſing with the ſpiritual eſſence of the plant; this, were it joined with its proper earth, would take to itſelf a more ſolid body. Now as ſoon as the veſſel or glaſs is removed from the fire, this idea or repreſentation vaniſhes, becoming a chaos and confuſed matter, returning to its ſediment, from whence it aroſe.

Another way to make the eſſence of a plant.] Put the herbs, flowers, ſeeds, ſpices, &c. into rectified ſpirit of wine: extract a very ſtrong and deep tincture, upon which put ſtrong oil of ſalt, and digeſt in Balneo, till an oil ſwim above, which ſeparate. Or elſe draw off the ſpirit of wine in Balneo, and the oil or eſſence will remain at bottom: but before the ſpirit of wine is abſtracted, the oil or eſſence is blood red, and a true quinteſſence.

Another way to make the true eſſence, or rather quinteſſence.] Make the water, oil, and volatile ſalt, as before is taught; and from the fæces extract the fixed ſalt, which purify according to art; which ſalt reſolve in a cellar upon a marble ſtone to an oil, which is what we call per deliquium, filter it and evaporate, till the ſalt is white as ſnow, with theſe ſalts imbibe as much of the oil as you can make it receive; then digeſt till the oil will not ſeparate from the ſalt, but become a fixed powder, melting with an eaſy heat.

To make the form of a firr tree appear in Colophonia.] Diſtil turpentine in a retort gradatim: when all is diſtilled off, keep the retort ſtill in a reaſonable heat, that what humidity is ſtill remaining may be evaporated, and it become dry. Take it then off from the fire, and hold your hand to the bottom of the retort, and the turpentine which is dried, (called alſo colophonia or roſin) will crack aſunder in ſeveral places, and in thoſe cracks, or chaps, you ſhall ſee

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the perfect figure of firr trees, which will there continue many months.

To make hartſhorn ſeemingly grow in a glaſs.] Take hartſhorn broken into ſmall bits, and put them into a glaſs retort to be diſtilled, and you ſhall ſee the glaſs to be ſeemingly full of horns; which will continue there ſo long, till the volatile ſalt be come over.

An excellent invention to make a pleaſant fire.] Take of the beſt New Caſtle coals three parts beaten ſmall; loam one part, mix them well together into a maſs with water, of which make balls, and dry them very well. This fire is durable, ſweet, and not offenſive, by reaſon of the ſmoak or cinders, as other coal fires are, but burns as well in a chamber as charcoal itſelf. And this fire may ſerve for ſuch diſtillations as require a ſtrong and laſting heat, as alſo for ordinary occaſions.

To make a durable and laſting oil.] 1. Take unſlacked lime, bay ſalt, oil olive, of each a like quantity; mix them well together, and diſtil in ſand: cohobate the oil upon the ſame quantity of freſh lime and ſalt; this do four times. 2. The oil by this means will be clear, and impregnated with what ſalt was volatile in the lime and ſalt. 3. If it be ſeven times diſtilled, it will be as pure, odoriferous, and ſubtil, as many diſtilled oils of vegetables. 4. This oil whilſt a diſtilling, has a moſt fragrant ſmell, and of a moſt durable quality, which durability comes from the ſaline impregnation; beſides which, it is good againſt any inveterate ache or pain in the limbs, or other parts. 5. A lamp made with this oil, will burn ſix or ſeven times as long, as that which is made with other oil; alſo it burns very ſweet. 6. You ought to be very cautious in making of it, or elſe your glaſſes will quickly break. 7. You muſt take very ſtrong lime, ſuch as your dyers uſe, and call Cauk.

To make a candle that ſhall laſt long.] Mix with your tallow unſlacked lime in powder; or make your candles of caſtle-ſoap: ſuch candles as theſe

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will be admirable for lamp furnaces. Now it is the ſalt in the lime and ſoap, that preſerves the tallow from burning out ſo faſt, as otherwiſe it would.

To make the diſtilled oil out of any herb, ſeed, flower, or paper, in a moment, without a furnace.] You muſt have a long pipe made of tin, or tobacco-pipe clay with a hole in it as big as a ſmall wallnut, three or four inches from one end of it, into which you muſt put the matter, you would have the oil of; ſet it on fire with a candle or a coal; then put one end of the pipe into a baſon of fair water, and blow at the other end, ſo will the ſmoak come into the water, and the oil will ſwim upon it, which you may ſeparate with a funnel.

To reduce roſin into turpentine again.] Take oil of turpentine and the colophonia, or roſin thereof, in powder; mix theſe together, and digeſt them, and you ſhall have turpentine of the ſame conſiſtency it was before; but of a more fiery and ſubtil nature: pills made thereof are more excellent for opening obſtructions of the breaſt, lungs, kidnies, bowels, &c. than thoſe that are made of raw turpentine.

To write or engrave upon an egg, pebble, flint, &c.] Write what you pleaſe with wax or greaſe upon an egg, pebble, flint, &c. then put it into the ſtrongeſt ſpirit of vinegar, or oil of ſalt, letting it lie two or three days; and you ſhall ſee every place about the letters or writing, eaten or conſumed away; but the place where the wax or greaſe was not at all touched.

To make a powder, which being wetted ſhall be kindled.] 1. Take a load-ſtone, powder it, and put it into a ſtrong crucible; cover it all over with a powder made of calx vive and colophonia, of each a like quantity; put alſo ſome of this powder under it: when the crucible is full, cover it, and lute the cloſures with potters earth, put it into a furnace, and there let it boil; after take it out, and put the matter into another crucible, and ſet it in a furnace alſo, this do till it becomes a very white and dry calx. 2. Take of this calx one part; ſal nitre well purified four parts ; and as much camphire, ſulphur vive, oil of turpentine and tartar ; grind what is to be ground to a ſubtil powder, and put all into a glaſs veſſel, with as much well rectified ſpirit of wine, as will cover them two inches over. 3. Stop the veſſel cloſe up, and ſet it in horſe-dung three months, ſo will all the matter become an uniform paſte : evaporate all the humidity, until the whole maſs becomes a very dry ſtone ; which take out, powder it, and keep it very dry. 4. If you take a little of this powder, and ſpit upon it, or pour ſome water thereon, it will take fire preſently, ſo that you may light a match, or any ſuch thing by it.

To make a room ſeem to be on fire.] Take rectified ſpirit of wine, and diſſolve camphire therein ; evaporate this in a very cloſe chamber, where no air can get in ; and he that firſt enters the chamber with a lighted candle, will be amazed ; for the chamber will ſeem to be full of fire, and very ſubtil, but of little continuance. This done in a cloſe cupboard or preſs, will be much more perſpicuous and viſible.

To make the four elements appear in a glaſs.] Take jet in fine powder an ounce and half : oleum tartari per deliquium (made without addition of any water) two ounces, coloured with a light green with verdigriſe : add thereto ſpirit of wine tinged with a light blue with indigo, two ounces : of the beſt rectified ſpirit of turpentine, tinged of a light red with madder, two ounces : mix all theſe in a glaſs, and ſhake them together, and you ſhall ſee the heavy black jet fall to the bottom, and repreſent the earth : next the oil of tartar made green falls, repreſenting the water : upon that ſwims the blue ſpirit of wine, repreſenting the air or ſky ; and uppermoſt of all will ſwim the ſubtil red oil of turpentine, repreſenting the element of fire. It is ſtrange to ſee how after ſhaking all theſe together, they will be diſtinctly ſeparated one from another. If it be well done, (as it is eaſy to do it) it is an admirable and glorious ſight.

To repreſent the whole world in a glaſs.] Take the fineſt ſal-nitre, what you pleaſe ; tin, half ſo much ;

mix them well together, and calcine them hermetically: then put them into a retort, to which adjoin a glaſs receiver, with leaves of gold put into the bottom thereof; lute them well together; put fire to the retort, until vapours ariſe that will cleave to the gold: augment the fire till no more fumes aſcend; then take away the receiver; cloſe it hermetically, and make a lamp fire under it; and you will ſee repreſented in it, the ſun, moon, ſtars, fountains, trees, herbs, plants, flowers, fruits, and indeed, even all things, after a very wonderful manner.

To make regulus of antimony, for antimonial cups.] Take antimony in powder, nitre, of each a pound; crude tartar in fine powder, two pounds; mix, put them into a crucible, cover the crucible, and melt, ſo will the regulus fall to the bottom, which pour into a braſs mortar ſmeared with oil. Or thus: Take antimony powdered, two pounds; crude tartar in powder, four pounds; melt as before. This regulus you may caſt into cups, pictures, medals, or what figures you pleaſe: theſe infuſed into two or three ounces of wine in an earthen glazed veſſel, or in a glaſs, in a gentle heat all night, gives you a liquor in the morning which will vomit: doſe from two drachms, to two ounces and a half; you may ſweeten it if you pleaſe with a little white ſugar. Theſe cups or pictures will laſt for ever, and be as effectual after a thouſand times infuſion as at firſt.

To cleanſe the face and ſkin.] Before any thing be uſed to paint, or make the ſkin beautiful, it muſt be made very clean thus; firſt waſh with warm water, and ſweet ſcented waſh-balls very well; then rub the face with a cloth, and waſh well with water in which wheat-bran is boiled; ſo is the ſkin prepared. —Or thus, take ſublimate one ounce, glair of ſix eggs, boil them in a glaſs veſſel, till they grow thick, then preſs out the water, with which waſh the ſkin.

To make a white fucus or paint.] Take talk and powder it, by beating of it in a hot mortar, to the powder of talk add diſtilled vinegar, boil it at a gentle fire in a wide glaſs, let the fat froth that ſwims at top, be taken off with a ſpoon; then evaporate the vinegar, and mix the remaining cream with flegm of common ſalt, or a little pomatum, with which waſh or anoint the face, and it will beautify it much.

Another, very excellent.] Take crude talk in powder one ounce, oil of camphire two ounces, digeſt till the oil is white; it is a noble fucus for ladies faces.

To make the aforeſaid oil of camphire.] Take camphire four ounces, bole twelve ounces, make them into balls and dry them in the ſun, then diſtil them in ſand in a glaſs retort, into a receiver that hath diſtilled rain water therein: firſt there will come forth a white matter, which melts in the alembick, and falls into the receiver, then a clearer water; and at laſt with a ſtronger fire, the oil we ſpeak of, ſweet ſcented, which rectified with ſpirit of wine will be yellow as gold.

Another excellent fucus made of pearl.] Diſſolve pearl in diſtilled vinegar; precipitate with oil of ſulphur per campanam; then ſweeten and digeſt with ſpirit of wine; abſtract the ſpirit, and you have a magiſterial fucus will melt like butter.

To make the beſt fucus or paint as yet known.] Take Venetian talk, cleave it into ſlices, digeſt it in the heat of the ſun, or of a horſe-dunghil for a month, with diſtilled vinegar, made of Spaniſh wine, adding every day new diſtilled vinegar to the former, till the vinegar be mucilaginous; which then diſtil by a luted retort and a large receiver with a naked fire. Firſt there comes forth the vinegar; then a white oil, which ſeparate. After you have cleanſed the ſkin, then firſt waſh with the vinegar, after anoint with the oil: if the face be firſt well waſhed from all impurity, this one anointing may hold for a month without fading. This coſmetick if rightly prepared, is worth about five pounds an ounce.

An excellent fucus made of bulls galls.] Take bulls galls dried in the ſun, whoſe tincture extract with ſpirit of wine, with which beſmear the face, being cleanſed, leaving it on for three or four days, without going abroad, or expoſing the ſkin to the air: at the end of the time cleanſe the face: ſo almoſt to a miracle, the ſkin of the face and neck is rendered moſt gratefully white, ſoft, delicate and amiable. This is the Spaniſh fucus which ſeveral ladies now uſe.

To make an excellent red fucus.] Make a decoction of red ſanders in double diſtilled vinegar, adding a little alum, with a few grains of muſk, ambergriſe, or of ſome ſweet ſpices, and you will have a perfect red fucus for the face.

Another very excellent.] Take juice of clove gillyflowers, with which mix a little juice of lemons: with this paint your face, and you ſhall have a pleaſing red colour.

To do the ſame another way.] Make a ſtrong infuſion of clove-gillyflowers in rectified ſpirit of wine, adding a few drops of oil of vitriol, or inſtead thereof a little alum, and the juice of a citron or lemon; ſo ſhall you have an excellent colour to beautify the face with.

A fucus or paint not eaſy to be diſcovered.] Take ſeeds of cardamoms or grains of paradiſe, cubebs, cloves, and raſpings of brazil, which infuſe in rectified ſpirit of wine for ten days, over a gentle heat; then ſeparate the ſpirit: this is ſo perfect a fucus, that it may deceive any man, for this clear water gives a freſh, red and lovely colour which will laſt long.

A fucus or coſmetick of river crabs.] Take of the fleſh which remains in the extremities of the great claws of river crabs (being boiled) a ſufficient quantity, which dry gently, and then extract a deep tincture with rectified ſpirit of wine; evaporate part of the menſtruum, till the tincture have a good thickneſs or body; with which (the ſkin being cleanſed) anoint the cheeks firſt, applying over it ſome other albifying coſmetick.

Spaniſh wool, wherewith women paint their faces red.] Boil ſhearings of ſcarlet in water of quick-lime half an hour, of which take two pounds, to which put brazil two ounces (raſped) roch alum, verdigriſe, of each one ounce, gum-arabic two drachms, boil all for half an hour, which keep for uſe.

To do the ſame another way.] Take ſpirit of wine one pound, cochineal half an ounce, raſped brazil one ounce, gum ammoniac three drachms, mix and digeſt till the gum is diſſolved ; then boil it gently, and ſtrain it for uſe, into which you may put old linen rags, or Spaniſh wool at pleaſure.

An excellent coſmetick or liquor of talk.] Take powder of talk (made by rubbing it with pumice ſtones ; or beating it in a very hot mortar ; or filing it with a goldſmith's ſmoothing file) eight ounces, ſalis tartari ſixteen ounces, calcine it twelve hours in a wind furnace, and ſet it in a cellar, ſeparating that which melts, from that which doth not : then calcine this dry calx added to four times its weight of ſal-nitre, with a ſtrong fire, ſo the talk will be melted into a clear white maſs, which being ſet in a cellar will turn to a clammy liquor. This wonderfully whitens and beautifies the ſkin, and takes away ſpots and freckles from the face : but you muſt not leave the liquor long on, but waſh it off with decoction of wheat bran, that it corrode not the ſkin.

To make the ſkin ſoft and ſmooth.] The face being very clean, as before directed, waſh it very well with a lixivium of ſalt of tartar, and after that anoint it with pomatum ; or which is better, oil of ſweet almonds, doing this every night going to bed.

A water to cleanſe the face from ſcurf and morphew.] Take diſtilled rain water ſix ounces, juice of lemons twelve ounces, mix them, and waſh with it morning and evening, anointing after it at night going to bed with the oil or pomatum aforeſaid.

An unguent which brings the ſkin to an exquiſite beauty.] Take of pomatum one ounce, ſalt of tartar one drachm, muſk twenty grains, mix them well, and (the face or ſkin being very clean) anoint morning and evening.

A wonderful coſmetick of great value.] Take white tartar twenty ounces, talk, ſalt, of each ten ounces, calcine them in a potter's furnace very well; then grinding the matter upon a marble, put it into Hippocrates his ſleeve, and ſet it in a cellar or other moiſt place for twenty or thirty days, and there will drop from it a precious oil; which being rubbed upon the ſkin ſoftly with a linen cloth (the ſkin being duly cleanſed firſt) takes away all kind of ſpots, and makes the ſkin ſoft and delicate.

A cheap, yet excellent coſmetick.] Take alum in fine powder, and ſhake it with whites of new laid eggs, being a little heated, till ſuch time as they grow thick to an ointment, with which anoint the face morning and evening three or four days; and it will take away ſpots and wrinkles, and make the ſkin grow clear and fair.

An excellent mercurial coſmetick prevalent againſt moſt deformities of the ſkin.] Take mercury purified from all blackneſs half a pound, mercury ſublimate in powder as much, mix them in a ſtone or marble mortar; put them into an alembick of a ſtrait orifice, put on diſtilled vinegar, till all be covered three or four fingers, letting it ſtand four days, daily ſtirring the ſame at certain times, then it extracts a whitiſh powder; the whitiſh vinegar by inclination ſeparate, rejecting it, and put on other vinegar: the powder at bottom keep ſo for ſome days: which labour you muſt ſo often reiterate, till you have abundance of that white powder, which dry, and keep for uſe: anoint with it, by mixing with it a little diſtilled rain water, and it will take away all blemiſhes of the ſkin, as alſo tetters. Uſe it not too often, and beware you touch neither eyes nor teeth with it.

Another of great eſtimation.] Take mercury ſublimate, ſaccharum ſaturni, of each two drachms, roſe water, juice of lemons, of each two ounces, mix them like to an ointment, with which anoint gently at night, and the next morning with the pomatum aforeſaid.

To make a kind of lac virginis, an excellent coſmetick.] Take diſtilled rain water a quart, ſaccharum ſaturni cryſtallized one ounce, mix them, and then waſh with the water, being ſettled: the fine white powder at bottom, is alſo an excellent fucus or paint, which may be laid upon the ſkin if very clean: note, ſome uſe vinegar inſtead of rain water.

To make oleum tartari per deliquium.] Take ſalt of tartar, which put into a bag with a corner in a moiſt cellar, and the oil will diſtil therefrom in drops: with this oil you may mix a little fair water, and waſh your face at night going to bed; and the next morning, the face being very clean, you may waſh with the aforeſaid lac virginis; thus continuing for ſome days, you may create an exquiſite and laſting beauty.

A compound coſmetick eſteemed by ſome of great force.] Take of the aforeſaid lac virginis one ounce, oil of tartar aforeſaid half an ounce, mix them, with which waſh morning and night for about a week or more, as you ſhall ſee occaſion; then anoint with the following ointment.

To make the coſmetick ointment aforeſaid.] Take muſk three drachms, ambergriſe two drachms, civet one drachm, grind them upon a porphyre or marble ſtone, with oil of ben and rhodium of each three ounces, with which anoint as aforeſaid: note, ſome inſtead of the oil of ben, uſe oil of ſweet almonds.

A vegetable coſmetick.] Beſmear your face or ſkin at night going to bed, with the juice of wake robin; it is excellent.

An incomparable coſmetick of pearl.] Diſſolve pearls in juice of lemons or diſtilled vinegar, which digeſt in horſe-dung, till they ſend forth a clear oil, which will ſwim on the top: this is one of the moſt excellent coſmeticks or beautifiers in the world: this oil, if well prepared, is richly worth ſeven pounds an ounce.

A coſmetick ointment of great worth.] Take of pomatum ſix ounces, ſaccharum ſaturni two ounces, mix them, and anoint morning and evening.

Another very good for the ſkin.] Mix ſaccharum ſaturni one drachm, in vinegar half an ounce, which mingle with the glair of eggs, and anoint with it.

A coſmetick wonderful to make a pleaſing ruddy complexion.] Take oil of tartar four ounces, alum, ſal gem, of each one ounce; borax, camphire, of each half an ounce; beat them well together, to which add of briony water a pint, diſtil them in balneo, and you will have your deſire.

Another for the ſame.] Take madder, myrrh, ſaffron, frankincenſe, of each alike, bruiſe and ſteep all in white-wine, with which anoint the face going to bed, and in the morning waſh it off, and the ſkin will have a pleaſing bluſh.

To make the coſmetick of myrrh, very excellent.] Boil eggs till they are hard, ſlit them and take out the yolks, fill them up with powdered myrrh, cloſe them together, and lay them in a moiſt cellar, and the myrrh will diſſolve into oil.

To make a very good waſh to whiten the ſkin, and give a good complexion.] Take lemons, hens eggs boiled, of each twelve, turpentine eight ounces, diſtil all in balneo Mariæ, with which waſh: when you waſh, you may put into it two or three drops of oil of oranges or cinnamon, for fragrancy ſake.

A coſmetick to make a rough ſkin ſmooth.] Take ſweet almonds blanched four pounds, moiſten them with ſpirit of wine and roſe water mixt together, of each two ounces, beat them together and fry them; and when they begin to ſmoak, put them into a bag, and preſs them (in a preſs made for that purpoſe) and there will come forth a very clear oil; which put into rain water, and beat it till it is exceeding white.

To take away ſun-burnings.] To glair of ten eggs put ſugar-candy one ounce, and anoint with it going to bed; or anoint with the juice of ſow-bread at night going to bed; and in the morning with oil omphacine. The like effects hath our lac virginis, as before directed, as alſo oleum tartari, and other things of like nature.

To take away redneſs and pimples.] Frſt prepare the ſkin by bathing it often with the decoction of wheat-bran, and applying poultices of bread, milk, and oil thereto; when the ſkin is thus ſuppled and rarified, you may cure them either by our liquor of talk, or mercurial coſmetic, or our lac virginis and oil of tartar, as before directed, or by often waſhing with juice of lemons.

To take away freckles.] Take juice of lemons, put it into a glaſs bottle, to which put fine ſugar, and borax in powder, digeſt it eight days in ſand, then uſe it; or often uſe our compound coſmetick, or oil of tartar alone, for ſome weeks, as before directed; but if all fail, you muſt have recourſe to our liquor of talk, or mercurial coſmetick, as before directed.

To take away ſpots from the face or ſkin.] This is done by anointing with oil of tartar for ten days; and after all that to waſh it with a lixivium of quick-lime in which ſal ammoniac hath been diſſolved for a long time; or you may uſe the coſmetick camphorated, as before directed.

To cleanſe a ſkurffy ſkin.] If the perſon be fat, foment firſt with a lixivium of ſalt of tartar; but if lean, make a fomentation of borrage, bugloſs and mallow leaves, which uſe for ſome days; this being done, bathe the place where the ſkurf is, with ſpiritus nicotianæ made by fermentation, which being dried in, anoint firſt with oil of tartar, then with oil of almonds; repeating the three laſt works ſo often till the ſkurf goes away. If all theſe fail, you muſt have recourſe to our liquor of talk, or mercurial coſmetick, as before directed.

To free the ſkin from tetters and ring-worms.] Diſſolve ſublimate one ounce in a glaſs of red-wine by boiling, with which waſh the place morning and evening, letting it dry of itſelf, for three or four days together, and it will certainly cure; if they be not inveterate, our liquor of talk, or mercurial coſmetick, as before directed, may ſufficiently do; or you may anoint with this ointment. Take of ſal tartari two drachms, burnt alum three drachms, powder and incorporate with whites of eggs: or this, take ſulphur vive three drachms, camphire one drachm, hogs-greaſe two ounces, mix and make an ointment.

To take away wrinkles from the ſkin.] Take oil of almonds, lees of oil olive, and make them into an oinment with wax, powder of camphire and maſtich, with which anoint. Oil of myrrh to anoint with, is eminent in this caſe: or waſh with a decoction of briony roots and figs of each alike: or diſſolve gum tragacanth in lac virginis, and waſh with that. Excellent good is a ſtrong decoction of pomegranate pills in white-wine, to waſh often with.

To take away warts.] The juice of the greater ſpurge with ſalt, anointed takes them away, ſo alſo a continual waſhing with a lixivium of quicklime and ſalt of tartar. The juice of verrucaria performs the ſame. A plaiſter of cantharides with a defenſative is very good in this caſe: ſo alſo this following waſh: take ſaccharum ſaturni three ounces, ſal ammoniac one ounce, vitriol common ſix drachms, quicklime eight ounces, boil all in water four pounds to the conſumption of the half, with which often bathe the warts, and then waſh with our mercurial water. Black ſoap hath often been found very good; but eſpecially a plaiſter of turpentine.

To heal chaps in the ſkin.] Our pomatum in this caſe is moſt excellent: yet this following is very good. Take capons greaſe mixed well with camphire, and anoint with oil of turpentine two drachms, mixed with unguentum populeon two ounces, is very good. So alſo oil of roſes mixed with ſheep ſuet and wax to an ointment.

To heal burning and ſcaldings.] Excellent good is the unguentum rubrum, or red ointment, both to draw out the fire, and to heal. To draw out the fire alſo, glair of eggs mixed with roſe-water, is very prevalent: ſo alſo is ſalt, raw onions, ſoap, yeſt, oil of tartar and the like. To hinder the riſing of the bliſters, hens dung three ounces, mixed with hogs greaſe four ounces, and ſalt of tartar one ounce, is very good: ſo alſo a cataplaſm of honey and crums of bread; but beſt of all a plaiſter of ſtrained opium, with oil and wax, which performs all the intentions to admiration. If the bliſter break, it may be preſently ſkinned by anointing with oil of eggs, and waſhing often with lac virginis, ſtrewing upon the ſore powder of bole, tutty, ceruſe, or the like.

To take away the ſcars and marks of the ſmall pox.] Take of oil of tartar one ounce and half, ceruſe diſſolved in oil of roſes one ounce, borax and ſal gem of each one drachm, mix and make an ointment, with which anoint. Oil of tartar alone performs this work well: ſo ſalt of tartar, mixed with powder of myrrh and oil of roſes. But emplaſt. epiſpaſticum is infallible and ſafe.

To beautify the hands.] To make them ſoft, often anoint with the oil of almonds, or with pomatum at night going to bed, waſhing them the next morning with decoction of wheat-bran: after a while waſh them with ſalt of tartar, diſſolved in fair water, perfumed with oil of cloves, oranges, rhodium or cinnamon. Or this, take Venice ſoap diſſolved in juice of lemons one pound, virgin-honey four ounces, ſublimate, orice root, ſugar, ſalt of tartar, alum, borax, of each one ounce; balſam of Peru, two drachms, oil of cloves one drachm, oil of rhodium and cinnamon of each half a drachm, make a mixture to waſh the hands withal. Or this, take powder of Venice ſoap one pound, orice root eight ounces, amylum ſix ounces, mix them and make an ointment with liquid ſtorax and oil of benjamin a ſufficient quantity; it wonderfully whitens, ſmooths and ſoftens the hands. To anoint alſo with a bulls gall is very good.

To help hands which are ſwoln, and look red or blue with cold.] What we even now ſaid, as before-mentioned,

tioned, may be ſaid again here: to which we add, that a long bathing of them in a lather of Caſtile ſoap, is very good if it be done: or if a repercuſſive plaiſter be applied made of barley meal, ſaccharum ſaturni, and oil of myrtles; waſhing (after the coming off of the cataplaſm) with juice of lemons or white-wine vinegar: a plaiſter of turpentine mixed with ſalt is good. Often to anoint the hands with oil of roſes, almonds, or pomatum at night, and the next morning with the lac virginis prevails much. Oil of anniſeeds, caraways and fennel prepared chymically, as alſo cloves and oranges, mixed with oil of almonds and often uſed, are eminent above all other things.

To make the ſkin ſoft, ſmooth, and white, take away pimples, morphew, ſcurf, &c.] Bathe the places affected well, morning and night, with powers of roſemary, amber, or lemon, and you will have your deſire in ſome ſhort time with advantage. Theſe things are beyond all hitherto named.

Of making a ſweet breath.] A ſtinking breath comes from one of theſe four cauſes, viz. putrified lungs, defective teeth, a diſtemper of the head, or obſtruction of the ſtomach.

To remedy a ſtinking breath coming from putrified lungs.] Take unguentum nicotianæ one ounce, oleum ſuccini two drachms, mix them and anoint the breaſt outwardly; inwardly give cleanſers, (as oil of ſulphur allayed with roſe-water, or rather digeſted with ſpirit of wine) morning and evening; as alſo antimonium diaphoreticum ten grains five times a day for ſeveral days together; then heal by giving oil of almonds mixed with a few drops of oil of cinnamon, or pills of turpentine: laſtly, morning, noon and night let this bolus be adhibited, take nutmegs, mace, ginger, of each fifteen grains, honey two drachms, oil of cinnamon ten drops, mix them, and continue it for ſome weeks. Bezoar mineral is famous.

To help the defects of the teeth.] 1. If the teeth be furred over, rub them every morning with cremor tartari in powder, and waſh them with white-wine. 2. If the teeth be black, allay oil of ſulphur or vitriol in roſe-water, and ſcour them well therewith, with the end of a ſtick and a rag, till all the blackneſs be gone; then rub them with oil of almonds perfumed with oil of cinnamon. 3. If the teeth be looſe, firſt rub them with this powder, take galls, pomegranate flowers, ſumach, cyperus, of each one ounce, roch alum half a pound, powder them all for uſe; then uſe this gargariſme. Take galls one ounce, myrrh, pomegranate peels of each half an ounce, boil them in white-wine vinegar for a gargariſme. Laſtly, morning, noon, and night waſh the gums with good red wine; by this means the teeth will be faſtened and the gums reſtored. 4. If they be in danger of rotting, take aſhes of hartſhorn, magiſtery of coral, of each one ounce, muſk, or inſtead thereof oil of cinnamon, ten grains, mix for a dentifrice to rub the teeth withal, it will keep them white and ſound. 5. If they be rotten and hollow, make little pellets of ſtrained opium, myrrh and oil of cinnamon, and put them into the hollow tooth. 6. If they ache, uſe the aforeſaid pellets, or make little ones of laudanum Paracelſi, and put them into the hollowneſs; or if they be not hollow, tie a little pill of the ſame up in a fine thin rag, and hold it between the acheing teeth. 7. If they ſtink, often waſh them with wine or ſpirit of wine, in which a few drops of oil of cinnamon and adeps roſarum is diſſolved. But for the pain, a doſe of laudanum at night going to bed, is without exception.

To rectify a ſtinking breath ariſing from diſtemper of the head.] Conſider the cauſe of the diſtemper, whether it ariſes from the pox, apoſtemes, or the like, and follow the method inſtituted in the cure of thoſe diſeaſes, and then the cauſe being taken away, the effects you will find will ſoon ceaſe; yet, nevertheleſs, theſe following pills are excellent: take calx of refined ſilver made by ſpirit of nitre, and well dulcified by waſhing in warm rain water, one ounce, reſinæ ſcammonii one ounce and half, mix them for a maſs of pills, of which take eight or ten grains at night going to bed every third, fourth, or fifth day.

To rectify a ſtinking breath ariſing from the obſtruction of the ſtomach.] This is done by opening and cleanſing the ſtomach thus. Take every evening going to bed half a drachm of pil. Ruffi for ten or twelve days together. Or thus, firſt vomit with vinum benedictum one ounce or more, according as ſtrength requires, twice or thrice; then take pilulæ Rudii half a drachm at a time, in the morning faſting, drinking after it ſome warm broth or poſſet-drink, which repeat every third or fourth day, four or five times.

To rectify the breath, when it ſmells of any thing that is eaten.] Chew coriander ſeed, or zedoary in the mouth, drinking a good draught of wine after; the ſcent of the wine is taken away by eating ſour apples or quinces, or by chewing troches of gum-tragacanth perfumed with oil of cinnamon.

To dye the hair black.] This is done with the calx of luna, made by ſpirit of nitre, mixed with fair water, and the hair waſhed therewith, with a ſponge: it is the moſt excellent thing of that kind that is yet known.

To keep the hair from falling off.] Take myrtle berries, galls, emblick myrobalans, of each alike; boil them in oil omphacine, with which anoint: it is an excellent medicine, yet as old as Galen.

To remedy baldneſs.] This is a hard thing to cure, yet the following things are very good. Rub the head or bald places every morning very hard with a coarſe cloth, till it be red, anointing immediately after with bears greaſe: when ten or fifteen days are paſt, rub every morning and evening with bruiſed onion, till the bald places be red, then anoint with honey well mixed with muſtard-ſeed, applying over all a plaiſter of labdanum mixed with mice dung, and powder of bees: do this for thirty days. If all the former fail, bathe with a decoction of burdock roots, made with a lixivium (of ſalt of tartar) two parts, and muſkadel one part; immediately applying this unguent: take thapſi or turbeth one drachm (in powder) bears greaſe one ounce, mix them, which uſe for ſixty days; if this make not the hair come, the defect is incurable.

To take away hair from places where it ſhould not grow.] Take quicklime four ounces, auripigmentum one ounce and a half, ſulphur vive, nitre, of each half an ounce, lixivium of ſalt of tartar a quart, mix and boil all ſo long in a glazed earthen pot, till putting a quill therein, all the feathers peel off, and it is done. Firſt foment the place with warm water a little before you uſe the aforeſaid medicine; a quarter of an hour after waſh with very hot water; then anoint with the aforeſaid unguent, and in a quarter of an hour it will do the work: when the hairs are fallen away, remember to anoint with oil of roſes; now to keep them from ever growing again, anoint for ſome days with an ointment made of the juice of henbane and nightſhade, opium and hogs greaſe.

To make the hair curl.] Waſh the hair very well with a lixivium of quicklime, then dry it very well, that done, anoint it with oil of myrtles, or oil omphacine, and powder it well with ſweet powder, putting it up every night under a cap: if the party be naturally of a cold and moiſt conſtitution, the waſhing, anointing, and powdering muſt be perpetually uſed once or twice a week during life, the hair being put up every night.

To make the hair lank and flag that curls too much.] Anoint the hair thoroughly twice or thrice a week with oil of lillies, roſes, or marſh-mallows, combing it after it very well.

To make the hair grow long and ſoft.] Diſtil hogs greaſe or oil of olive in an alembic with the oil that comes there from anoint the hair, and it will make it grow long and ſoft: uſe it for uſe.

To preſerve the hair from ſplitting at the ends.] Anoint the ends thereof with oil omphacine, or oil of myrtles,

tles, they are eminent in this caſe to preſerve the hair from ſplitting, ſo alſo an ointment made of honey, bees-wax, and oil omphacine, or bears greaſe.

To make the oil of ben.] Blanch the nuts, and beat them very carefully in a mortar, and ſprinkle them with wine, put them into an earthen or iron pan, and heat them hot, then put them into a linen cloth, and preſs them in an almond preſs; this work repeat, till all the oil is extracted, ſo have you oil of ben by expreſſion. In like manner you may expreſs the oil out of citron ſeeds, incomparable for this purpoſe, to extract the ſcent out of muſk, civet, amber, and the like, becauſe it will not quickly grow rank, yet oil of the nut ben is much better. This oil of ben hath two properties; the one is, that having no ſcent or odour of itſelf, it alters, changes or diminiſhes not the ſcent of any perfume put into it; the other is, that it is of a long continuance, ſo that it ſcarcely ever changeth, grows rank, corrupts or putrifies, as other oils do. To make a purfume thereof, put the muſk, amber, &c. in fine powder thereinto, which keep in a glaſs bottle very cloſe ſtopped, for a month or more, then uſe it. Or thus, blanch your nuts, and bruiſe them, (almonds may do though not ſo good) and lay them between two rows of flowers, ſuppoſe roſes, jaſmine, &c. or other perfumes; when the flowers have loſt their ſcent and fade, remove them, adding freſh ones; which repeat ſo long as flowers are in ſeaſon; then ſqueeze out the oil, and it will be moſt odoriferous. Laſtly, by this laſt you may draw a ſweet ſcent out of thoſe flowers, out of which you cannot diſtil any ſweet water.

The firſt ſweet water.] Take cloves in powder two drachms, yellow ſanders, calamus aromaticus of each one ſcruple, aqua roſarum damaſcenarum fifteen pounds; digeſt four days, then diſtil in an alembick; to this new diſtilled water put in powder cloves, cinnamon, benjamin, ſtorax calamita of each one drachm, diſtil again in balneo: laſtly, put the water

ter into a glaſs bottle with muſk and ambergriſe of each ten grains, keep it cloſe ſtopt for uſe.

The ſecond ſweet water.] Take damaſk roſes exungulated three pounds, flowers of lavender and ſpike of each four ounces, clove-gillyflowers, and flowers of jaſmine, of each two pounds, orange-flowers one pound, citron peels four drachms, cloves two drachms, cinnamon, ſtorax calamita, benjamin, nutmegs, of each two ſcruples all in powder, aquæ roſarum ſix pounds, digeſt ten days, then diſtil in balneo: to the diſtilled water add of muſk and ambergriſe of each thirty grains.

The third ſweet water.] Take roſes, clove-gillyflowers of each one pound, flowers of roſemary, lavender, jaſmine, marjoram, ſavory, thime, of each three ounces, dry citron peels one ounce, cinnamon, benjamin, ſtorax calamita, of each two drachms, nutmegs, mace, of each one drachm, bruiſe the herbs and ſpices well, digeſt in the ſun two days, then diſtil in balneo: to the diſtilled water add muſk in powder one ſcruple.

The fourth ſweet water.] Take cloves, cinnamon of each one drachm, mace, grains, muſk, ambergriſe, citron peels of each half a ſcruple, benjamin, ſtorax calamita of each one ſcruple, aquæ roſarum twelve pounds, digeſt fifteen days, then diſtil in balneo.

The fifth ſweet water.] Take roſemary-flower water, orange-flower water of each five pounds, ambergriſe one ſcruple, digeſt ten days, then diſtil in balneo.

The ſixth ſweet water.] Take roſes two pounds, macaleb half a drachm, ambergriſe ten grains, bruiſe what is to be bruiſed, digeſt in ſand three days, then diſtil in balneo.

The ſeventh ſweet water.] Take green peels of oranges and citrons of each four drachms, cloves half a drachm, flowers of ſpike ſix ounces, aquæ roſarum damaſcenarum ſix pounds, digeſt ten days, then diſtil in balneo.

The eighth ſweet water.] Take of the water, as before directed, ſix pounds, muſk ten grains, mix and digeſt them for uſe.

The ninth ſweet water.] Take aquæ roſarum, aquæ florum de jaſmine of each four pounds, muſk one ſcruple, digeſt ten days, then diſtil in ſand.

The tenth ſweet water.] Take damaſk-roſes, muſk-roſes, orange-flowers of each four pounds, cloves two ounces, nutmegs one ounce, diſtil in an alembick, in the noſe of which hang muſk three ſcruples, amber two ſcruples, civet one ſcruple, tied up in a rag dipt in bran, and the white of an egg mixed.

The eleventh ſweet water, called, aqua nanſa, or naphe.] Take aqua roſarum four pounds, orange-flower-water two pounds, waters of ſweet trefoyl, lavender, ſweet marjoram of each eight ounces, benjamin two ounces, ſtorax one ounce, labdanum half an ounce, mace, cloves, cinnamon, ſanders, lignum aloes of each one ounce, ſpicknard one ounce, all being groſly beaten, digeſt a month, then in a glaſs retort diſtil in balneo.

The twelfth ſweet water, called, aqua moſchata.] Take ſpirit of wine rectified to the higheſt, two pounds, muſk three ſcruples, ambergriſe two ſcruples, civet one ſcruple, digeſt in the ſun twenty days cloſe ſtopped in a glaſs veſſel ; a drop of this water put into any other liquor, will very well perfume it.

So may you extract the ſcent out of ſweet flowers, with this difference, that they lie but a little while, becauſe their earthly ſubſtance will make the ſpirit ill-ſavoured.

The thirteenth ſweet water.] Take a quart of orange-flower-water, and as much damaſk-roſe-water; add thereto muſk willow ſeeds groſly bruiſed four ounces, benjamin two ounces, ſtorax one ounce, labdanum ſix drachms, lavender flowers two pugils, muſked caneſbill three pugils, ſweet-marjoram as much, calamus aromaticus a drachm, diſtil all in a glaſs ſtillatory in balneo, the joints being well cloſed that no vapour get out.

To make oleum imperiale.] Take ambergriſe four drachms, ſtorax calamita, eight ounces, roſe-water, oleum roſatum of each two pound, oil of cinnamon and cloves of each half a drachm, put all into a glaſs, and digeſt in horſe dung twenty days; this done, gently boil all for a quarter of an hour, which then let cool; with a ſpoon take off the oil which ſwims a top, to which put of muſk and zibet of each two drachms, digeſt all in a gentle heat for twenty days, and keep it for uſe. Where note, the amber and ſtorax at bottom will ſerve to make ſweet balls of, to lay among cloaths, or beads to carry in ones hands; or for a perfume to burn.

To make oil of cinnamon.] Digeſt cinnamon groſly bruiſed in ſpirit of wine, ſharpened with oil of ſalt, in a glaſs veſſel, with a blind head cloſely luted, in a gentle heat for ten days, then diſtil in an alembick. It is a wonderful perfume, the moſt fragrant and pleaſant of all oils, as well in taſte as ſmell: the uſe of it will certainly take away a ſtinking breath.

To make oil of roſes.] Take damaſk-roſes, pickle them with bay ſalt, and after three months, with a large quantity of water diſtil in aſhes with a gentle fire, ſo have you oil, and ſpirit or water, which keep for other diſtillations.

This is the greateſt of all vegetable perfumes, and of an ineſtimable value.

To make oil of calamus aromaticus.] It is made as oil of cinnamon: it is a very great perfume, helps a ſtinking breath, vomiting, weak memory, &c.

To make oil of rhodium.] It is made as oil of cinnamon: it is a very excellent perfume, good for the head, breath, and the ſenſes.

To make oil of benjamin.] Take benjamin ſix ounces in powder, which diſſolve in oil of tartar and aquæ roſarum of each one pound, which diſtil with a cloſe pipe in an alembick. So is made oil of ſtorax and labdanum.

To make oil of ſtorax compound.] Take oil of ben, or ſweet almonds one pound, ſtorax groſly beaten four ounces, benjamin, cloves, of each two ounces, digeſt (till the gums are melted) over hot coals; then preſs out the oil diligently.

To make ſpirit of ambergriſe.] Take of the beſt rectified ſpirit of wine a pint, ambergriſe, muſk (both in fine powder) of each two drachms, ſeal up the glaſs hermetically, and digeſt in a very gentle heat, till the tincture is fully drawn out; three or four drops of this ſpirit will perfume a pint of any liquor richly. Or you may put a drop or two round the brims of a drinking glaſs; half a ſpoonful of it mixt with a fit vehicle, is a rich cordial.

To make a perpetual motion in a glaſs.] Take quickſilver, tin, ana ſeven ounces: pure ſublimate fourteen ounces, diſſolved in a cellar upon a marble, (which in four days will become like oil olive) mix and diſtil in ſand, and there will ſublime a dry ſubſtance: put the water which diſtils off, back upon the earth in the bottom of the ſtillatory, and diſſolve what you can: filter it, and diſtil it again, and this do four or five times, then will that earth be ſo ſubtil, that being put into a vial, the ſubtil atoms thereof will move up and down for ever: but you muſt be ſure to keep the glaſs cloſe ſtopt, and in a dry place-

Of perfuming eſſences.] The way to extract eſſences is ſomewhat difficult, viz. by diſtillation, calcination, digeſtion or menſtruum. If by menſtruum, uſe not a watry one for a watry eſſence; nor an oily one for an oily eſſence; becauſe being of like natures, they are not eaſily ſeparated; but on the contrary, chuſe an oily menſtruum for a watry eſſence, and a watry menſtruum for an oily eſſence. If the eſſence of any metal be to be extracted by a corroſive menſtruum, after the work is done, ſeparate the ſalts from the waters, and uſe only thoſe ſalts which will be eaſily taken out again; vitriol and alum are very difficult to be ſeparated by reaſon of their earthy ſubſtance.

To extract the eſſence out of muſk, ambergriſe, civet, and other ſpices or aromaticks.] Mix the perfume with oil of ben, which in a glaſs bottle ſet in the ſun or ſand for ten days, then ſtrain it from the dregs, and the eſſence will be imbibed in the oil. Then take ſpirit of wine, and diſtilled fountain water, which mix with the ſaid oil, and digeſt for ſix days: then diſtil in ſand; ſo will the eſſence and water aſcend, (the oil remaining at bottom without any ſcent) that eſſence and water diſtil in balneo in a glaſs veſſel, till the water be come off, and leave the eſſence in the bottom in the form of oil.

Another way to do the ſame.] Infuſe the matter in ſpirit of wine a ſufficient quantity, digeſt and ferment for ten days, then diſtil in ſand, as long as any water will come over (but have a care of burning) which diſtilled liquor draw off in balneo, with a very gentle heat, and the quinteſſence will be left in the bottom, of a liquid form.

To extract the eſſence out of herbs and flowers, as of ſweet marjoram, baſil, orange-flowers, jaſmine, &c.] Bruiſe the matter, and put it into a glaſs veſſel to ferment in horſe-dung for a month; then diſtil in balneo: ſet it in dung for a week again, and diſtil in balneo again; which reiterate ſo long as it will yield any liquor; put the diſtilled matter upon the caput mortuum, diſtilling thus for ſix days: draw off the water in balneo; and the eſſence remaining expreſs in a preſs; which being a week fermented in dung, will yield the perfect ſcent, colour and virtues of the matter deſired.

To extract the eſſence out of ſalts.] Calcine the ſalt, and grind it very ſmall, then lay it upon a marble in a moiſt cellar, ſetting under it a pan to receive the diſſolution; therein let it ferment for a month, then with a gentle fire diſtil in balneo: caſt away the inſipid water, which comes from it; and ſet that which remains in the bottom, to ferment another month, then diſtil out the inſipid water as before; repeating this work ſo long as any inſipid water may be drawn: then evaporate away all the moiſture, and what remains is the quinteſſence of ſalt. Where, note, 1. That theſe ſaline quinteſſences as they may be uſed, will draw forth the perfect and compleat eſſence of any vegetable whatſoever. 2. That the eſſence of ſalts thus drawn, will ſcarcely come to two ounces in a pound.

To make unguentum pomatum, or ointment of apples.] Take hogs lard three pounds, ſheeps ſuet nine ounces, bruiſed cloves one drachm, aqua roſarum two ounces, pomwaters pared and ſliced one pound, boil all to the conſumption of the roſe-water; then ſtrain without preſſing, to every pound of which add oil of rhodium and cinnamon, of each thirty drops.

To make a compound pomatum.] Take of the pomatum aforeſaid (without the oils) four pounds, ſpicknark, cloves, of each two ounces, cinnamon, ſtorax, benjamin, of each one ounce, (the ſpices and gums bruiſed and tied up in a thin rag) roſe-water, eight ounces; boil to the conſumption of the roſe-water, then add white wax eight ounces, which mix well by melting, ſtrain it again being hot; and when it is almoſt cold, mix therewith oil of muſk, then put it out, and keep it for uſe.

Another excellent ointment.] Take hogs greaſe one pound, ſaccharum ſaturni two ounces, mix them well by gently melting them; to which add oils of muſk and ambergriſe of each half an ounce, let them all cool, and beat the unguent well in a mortar, and keep it for uſe.

To make unguentum moſchatum.] Take hogs greaſe one pound, ambergriſe, moſch of each one drachm and a half, (ground with oil of jaſmine upon a marble) adeps roſarum half an ounce (ground with civet one drachm) mix all together into an ointment, which keep for uſe.

To make powder of ox dung.] Take red ox dung in the month of May and dry it well, make it into an impalpable powder by grinding: it is an excellent perfume without any other addition; yet if you add to one pound of the former, muſk and ambergriſe of each one drachm, it will be beyond compariſon.

To make Cyprian powder.] Gather muſk moſs of the oak in December, January or February, waſh it very clean in roſe-water, then dry it, ſteep it in roſe-water for two days, then dry it again, which do often times; then bring it into fine powder and ſierce it; of which take one pound, muſk one ounce, ambergriſe half an ounce, civet two drachms, yellow ſanders in powder two ounces, mix all well together in a marble mortar.

Another way to make the ſame.] Take of the aforeſaid powder of oak-moſs one pound, benjamin, ſtorax of each two ounces in fine powder; muſk, ambergriſe and civet of each three drachms, mix them well in a mortar.

A ſweet powder to lay among cloaths.] Take damaſk-roſe leaves dried one pound, muſk half a drachm, violet leaves three ounces, mix them and put them in a bag.

Another for the ſame, or to wear about one.] Take roſe leaves dried one pound, cloves in powder half an ounce, ſpicknard two drachms, ſtorax, cinnamon of each three drachms, muſk half a drachm, mix them and put them into bags for uſe.

Powder of ſweet orrice, the firſt way.] Take Florentine orrice root in powder one pound, benjamin, cloves of each four ounces in powder, mix them.

Powder of Florentine orrice, the ſecond way.] Take of orrice root ſix ounces, roſe leaves in powder four ounces; marjoram, cloves, ſtorax in powder, of each one ounce; benjamin, yellow ſanders, of each half an ounce; violets four ounces, muſk one drachm, Cyperus half a drachm, mix them: being groſs powdered, put them into bags to lay amongſt linen but being fine, they will ſerve for other uſes, as we ſhall ſhew.

Powder of orrice roots, the third way, excellent for linen in bags.] Take roots of iris one pound, ſweet marjoram twelve ounces; flowers of roſemary and Roman cammomile, leaves of time, geranium moſchatum, ſavory, of each four ounces; Cyperus roots, benjamin, yellow ſanders, lignum rhodium, citron peel, ſtorax, labdanum, cloves, cinnamon, of each one ounce; muſk two drachms, civet one drachm and a half, ambergriſe one drachm, powder and mix them for bags. This compoſition will retain its ſtrength near twenty years.

Powder of orrice, the fourth way.] Take orrice roots in powder, one pound; calamus aromaticus, cloves, dried roſe leaves, coriander ſeed, geranium moſchatum, of each three ounces; lignum aloes, marjoram, orange peels, of each one ounce; ſtorax one ounce and a half, labdanum half an ounce, lavender, ſpicknard, of each four ounces; powder all and mix them, to which add muſk, ambergriſe, of each two ſcruples.

Pulvis calami aromatici compoſitus.] Take calamus aromaticus, yellow ſanders, of each one ounce; marjoram, geranium moſchatum, of each one ounce; roſe leaves, violets, of each two drachms; nutmegs, cloves, of each one drachm; muſk half a drachm; make all into powder, which put in bags for linen.

Another of the ſame.] Take calamus aromaticus, Florentine oris roots, of each two ounces; violet flowers dried, one ounce; round Cyperus roots two drachms; adeps roſarum one drachm and a half, reduce all into a very fine powder: it is excellent to lay among linen, or to ſtrew in the hair.

An excellent perfuming powder for the hair.] Take iris roots in fine powder one ounce and a half, benjamin, ſtorax, cloves, muſk, of each two drachms: being all in fine powder, mix them for a perfume for hair powder. Take of this perfume one drachm, rice-flower impalpable one pound, mix them for a powder for the hair. Note, ſome uſe white ſtarch, flower of French beans and the like.

A ſweet powder for a ſilk bag.] Take benjamin, ſtorax calamita, cloves, lignum aloes, of each two ounces; yellow ſanders three ounces, Florentine orris ſix ounces, muſk half a drachm, mingle them.

Another for the ſame.] Take Florentine orris, ſpicknard, ſweet marjoram dried, geranium moſchatum, of each four ounces; damaſk-roſes, Cypreſs, levender flowers, of each three ounces; benjamin, lignum rhodium, of each an ounce, mix them.

Another for the like intention.] Take damaſk-roſes, yellow ſanders, lignum aloes, of each four ounces, benjamin, ſpicknard, Cypreſs, of each two ounces, mingle them together.

Another for the ſame purpoſe.] Take damaſk-roſe leaves a handful, cut off the whites, put them in a glaſs, and put to them muſk half a ſcruple, ambergriſe ſix grains, civet four grains, ſtop the glaſs cloſe, and ſet it in the ſun till the leaves be thorough dry.

A powder for a ſweet bag.] Take orrice, Cypreſs, white ſanders, lavender, damaſk-roſes, of each four ounces; calamus, ſtorax calamita, benjamin, ſweet baſil, ſweet marjoram, geranium moſchatum, of each two ounces; cloves, roſemary flowers, of each one ounce, mix them.

Another ſweet bag.] Take damaſk-roſes four ounces and a half; marjoram, orrice, of each four ounces; geranium moſchatum three ounces; labdanum two ounces and a half; lignum aloes, white ſanders, cloves, Cypreſs, benjamin, calamus, of each two ounces; muſk, ambergriſe, of each one drachm, mingle them.

White damaſk powder.] Take orrice in powder, white ſtarch, of each eight ounces; fine muſk a ſcruple, mix it firſt with a little, then with more, and laſtly with the whole by degrees, the longer it is kept the better.

Another damaſk powder.] Take damaſk-roſes in powder two ounces and a half; calamus, orrice, Cypreſs, geranium moſchatum, lavender flowers, ſweet marjoram, labdanum, of each two ounces; benjamin, ſtorax calamita, of each an ounce and half; nigella romana one ounce; muſk, ambergriſe, of each a drachm, mingle them.

Another damaſk powder.] Take orrice four ounces; cloves two ounces; labdanum, Cypreſs, benjamin, of each one ounce; calamus, ſtorax calamita, of each half an ounce; civet, muſk, of each ten grains, mix them.

Another ſweet powder.] Take orrice ſix ounces; cloves four ounces; yellow ſanders, ſtorax calamita, ana, two ounces; labdanum one ounce, muſk a ſcruple, make a powder.

Natural balſams perfumed.] Take balſamum verum one ounce, muſk, ambergriſe, civet of each two ſcruples, mix them, for a perfume: it is the moſt fragrant and durable of all perfumes.

An odoriferous compound balſam.] Take of the aforeſaid balſam perfumed one ounce, oils of rhodium and cinnamon of each two drachms, mix them: this is an incomparable perfume, and better than the other for ſuch as are not affected ſo much with muſk.

Balſamum moſchatum.] Take oil of muſk one drachm, oil of cinnamon half a ſcruple, virgin wax one drachm and a half, melt the wax, and mix them according to art.

Another very good.] Take cloves, cinnamon, lavender, nutmegs of each two drachms, oils of cloves and rhodium of each half a drachm, wax three drachms, muſk and ambergriſe of each ten grains, mix them into a balſam.

Another very excellent for thoſe that love not the ſcent of muſk and the like.] Take oil of geranium moſchatum, adeps roſarum, oil of cinnamon of each one drachm, virgin wax ſix drachms, melt the wax, and mix the oils for a perfume.

To make red muſkardines or tablets.] Diſſolve gum tragacanth in roſe-water, ſo that it may be as thick as jelly; which make into paſte with the following compoſition. Take amylum one pound, fine ſugar half a pound, cochineal two ounces, muſk three drachms, all being in fine powder, mix them, and make tablets with the aforeſaid mucilage of tragacanth, ſquare, long, round, or of what form you pleaſe, which dry in an oven, out of which bread hath been lately drawn; but be ſure you dry them till they be as hard as horns.

Another ſort of red tablets.] Take of the aforeſaid compoſition one pound, cloves, cinnamon, nutmegs, ginger of each two ounces, cochineal one ounce, all being in fine powder, make it into tablets, with the aforeſaid mucilage, and dry as aforeſaid.

To make yellow tablets.] Take amylum one pound, fine ſugar half a pound, yellow ſanders four ounces, ſaffron two ounces, (or you may dip the amylum in ſtrong tincture of ſaffron, and then dry it again) muſk four drachms, all being in fine powder, make the maſs into tablets, with the aforeſaid mucilage, adding oil of cinnamon in drops two drachms, dry them carefully in the ſhade.

Another ſort of yellow tablets.] Take amylum died with tincture of ſaffron one pound, ſugar half a pound, ſaffron two ounces, nutmegs, cinnamon, ginger of each one ounce, carroways half an ounce, muſk three drachms, ambergriſe one drachm, all in fine powder make into tablets, as aforeſaid, adding oil of cinnamon two drachms; which dry in the ſhade, till they be as hard as horn.

To make muſcardines or tablets of any other colour.] You muſt make them after the ſame manner, only adding the colour you do intend; and in this caſe we think that it is better that the amylum be dipt in the tincture, and dried firſt before you uſe it. Where note, that theſe tablets, when uſed, are to be held in the mouth, in which they will diſſolve, thereby cheering the heart, reviving the ſenſes, comforting the ſpirits, ſtrengthning nature, reſtoring the body, and indeed nobly perfuming the breath. For them that do not love muſk, you may make them without, uſing inſtead thereof, ſo much the more oil of roſes or cinnamon.

Of making pomanders for bracelets, the firſt ſort.] Take orrice powder, cloves, mace, cinnamon, of each half an ounce; yellow ſanders, ſtorax, ſweet aſſa, of each two drachms; ambergriſe, muſk, of each one drachm; balſam of Peru, oil of rhodium, of each one ſcruple; civet, two drachms; all being in fine powder, (except the balſam and oil) mix together, and make into paſte with mucilage aforeſaid, of which form beans, drying them in the ſhade for uſe.

The ſecond ſort.] Take ſtorax, labdanum, of each one drachm and a half; benjamin, one drachm; cloves, mace, ſpicknard, geranium moſchatum, of each ten grains; muſk, ambergriſe, of each ſix grains; with mucilage make a pomander for bracelets.

The third ſort.] Take damaſk-roſe leaves exungulated two ounces, beat them impalpable: muſk, ambergriſe of each two ſcruples, civet one ſcruple, labdanum one drachm, with mucilage of gum tragacanth, in roſe water aforeſaid, make a pomander for bracelets.

The fourth ſort.] Take ſtorax, benjamin of each an ounce and half, muſk two drachms, oil of cinnamon one drachm, with mucilage aforeſaid, make a paſte of pomander, very excellent.

The fifth ſort.] Take ſpicknard an ounce, ſweet marjoram, geranium moſchatum, of each half an ounce, orrice, cloves, of each two drachms, calamus, lignum rhodium, lignum aloes, of each a drachm, Cyperus, benjamin, cinnamon, white ſanders, of each a ſcruple, labdanum, ſtorax calamita, and liquida, of each half a ſcruple, with mucilage of gum tragacanth in roſe-water, make a paſte for pomanders.

The ſixth ſort.] Take ſtorax calamita two ounces, baſil three ounces, cloves an ounce and half, benjamin, marjoram, ſtorax liquid, of each one ounce, calamus, Cypreſs, labdanum, of each half an ounce, muſk a ſcruple, ambergriſe twelve grains, civet ſix grains, with mucilage of gum tragacanth in roſe-water, make pomanders.

The ſeventh ſort.] Take labdanum an ounce, ſtorax, cloves, mace, cinnamon, of each three drachms, ambergriſe, muſk, of each a drachm and a half, virgin wax an ounce, mixt with ſweet or chymical oil of bays half an ounce, diſſolve, mix and work them well together.

The eighth ſort.] Take labdanum ſix ounces, wax two ounces, camphir, calamus, myrrh, yellow ſanders, wood of aloes, olibanum, maſtich, of each two drachms,

drachms, cinnamon, cloves, zedoary, ſtorax, calamint, of each a drachm and half, muſk, ambergriſe, of each a ſcruple, put them into a mortar, and with a little malmſey, make a maſs for pomanders.

The ninth ſort.] Make gum tragacanth half a pound into a mucilage with damaſk-roſe water muſkified, to which add ſtorax calamita nine ounces, nutmegs four ounces, labdanum three ounces, cinnamon, cloves, camphir, liquid ſtorax, natural balſam, of each one ounce; put the labdanum into the mortar, with a little oil of ſpike, and then the other things, which beat into a paſte, with powder of black ſallow charcoal.

The tenth ſort] Take ſtrong mucilage of gum tragacanth in roſe-water, which make into paſte with muſk and ambergriſe in fine powder, of each a like quantity, then anointing your palm and fingers with oil of muſk, or ſome other ſweet oil, as of lavender or the like, form them into round little balls or beads, which put upon a ſtring, and dry them between two papers, being dried, keep them cloſe from the air, till you have occaſion to uſe them.

To make barbers waſh-balls.] Take purified Venetian ſoap ſix ounces, macaleb four ounces, ireos, amylum of each ſeven ounces, cloves two ounces, labdanum, anniſeeds of each one ounce, nutmegs, marjoram, Cypreſs powder, geranium moſchatum, camphire of each half an ounce, ſtorax liquida half a drachm, muſk ten grains, all being in fine powder, with a little fine ſugar, beat all in a mortar, and make them up into waſh-balls.

To do the ſame another way.] Take of the ſaid ſoap two pounds, juice of macaleb two ounces, cloves, orrice, of each three ounces, labdanum two ounces, ſtorax one ounce, all being in fine powder, mix with the ſoap, of which make balls, drying them in the ſhadow.

To make balls of white ſoap.] Take of white ſoap five pounds, iris four ounces, amylum, white ſanders, of each three ounces, ſtorax one ounce, all in powder, ſteep in muſk-water, of which make paſte for waſh-balls.

Another ſort very good.] Take of white ſoap four pounds, orrice ſix ounces, macaleb three ounces, cloves two ounces, all in powder mix with the ſoap, with a little oil of ſpike, rhodium or the like, of which make balls.

Another way to make them of goats fat.] Make a ſtrong lixivium of pot-aſhes, as that a new laid egg will ſwim thereupon, which boil with citron-peels: take of this lye twenty pounds, goats fat two pounds, boil it for an hour, then ſtrain it through a linen cloth into broad platters of fair water, expoſing it to the ſun, mix it often every day till it begins to grow hard, of which you may form balls, which you may perfume with muſk half a drachm, civet one ſcruple, oil of cinnamon ten grains.

To make common waſh-balls, the beſt of that kind.] Take Venice or caſtile ſoap ſliced very thin, four pounds, ſpirit of wine half a pint, beat all together; then add chymical oil of ſaſſafraſs or lemons an ounce or more; and beat again very well: laſtly, add white ſtarch made into a paſte with water by boiling a ſufficient quantity to make all into an even and ſmooth maſs, which form into balls of four ounces a piece, with powder of white ſtarch, dry them and keep them for uſe.

To purify Venetian ſoap.] Cut it ſmall, to which put ſome roſe-water, or other perfuming water, boil them a while, then ſtrain it and it will be ſweet and good, then take off the ſoap which ſwims a top with a ſpoon, and lay it upon a tile, and it will preſently be dry, being white, free from filth and unctuoſity.

Another way to do the ſame.] Grate the ſoap, and dry it in the ſun, or an oven, powder and ſierce it, then moiſten it with ſome ſweet water or oil of ſpike, which dry again, in the ſhadow, and keep it for uſe.

To make white muſked ſoap.] Take white ſoap purified as aforeſaid, three pounds, milk of macaleb one ounce, muſk, civet, of each ten grains, mix them, and make all into thick cakes or rouls.

Another kind of ſweet ſoap.] Take of the oldeſt Venice ſoap, which ſcrape and dry three days in the ſun (purifying it as aforeſaid) two pounds, ireos, amylum, of each ſix ounces, ſtorax liquida two ounces, mix them well whilſt hot, which put into pans to form cakes.

To make ſoft ſoap of Naples.] Take of lixivium of pot-aſhes (ſo ſtrong as to bear an egg) ſixteen pounds, deers ſuet two pounds, ſet them upon the fire to ſimper; put all into a glazed veſſel with a large bottom, ſet it in the ſun for a while, ſtirring it five or ſix times a day with a ſtick, till it wax hard like paſte. Then take of this paſte, to which put musked roſe-water; keep it eight days in the ſun, ſtirring it as aforeſaid, ſo long as it may be neither too hard nor too ſoft; then put it up in boxes or pots.

To make the ſame ſoap muſked.] Put to the ſaid ſoap, roſe-water two pounds, fine musk in powder half a drachm, then mix the ſaid water as before.

Another exquiſite ſoap.] Take of the aforeſaid lixivium or oil of tartar per deliquium twelve pounds, oil olive three pounds, mix them, amylum two pounds, Roman vitriol one ounce in powder, glair of eggs two ounces, put all together, and ſtir continually for four hours time, then let it ſtand the ſpace of a day and it is done. You may perſume it as before; this makes the hair fair.

Another exceeding the former.] Take crown ſoap, vine aſhes, of each one pound, make it into cakes with powder of roch-alum and tartar of each alike, which you may perfume at pleaſure.

To get the juice or milk of macaleb.] Take the ſweet and odoriferous grains of macaleb, which beat in a mortar (with roſe-water, or ſome perfuming water) till it becomes like pap, then preſs out the juice or milk; which uſe within two or three days leſt it ſpoil.

To make perfumed lights.] Take olibanum two ounces, camphire one ounce, beat them into powder,

der, of which make, with wax, balls or rowls, which put into a glaſs lamp with roſe-water and lighted with a candle, will give a fair light, and a very good ſcent.

Another for a lamp.] Take ſweet oil olive one pound, benjamin, ſtorax in powder one ounce, muſk, ambergriſe, of each one ſcruple, mix all with the oil, which put into a lamp to burn; and the oil will yield a fragrant odour.

To make perfumed candles.] Take labdanum, myrrh, xylo-aloes, ſtorax calamita, of each one ounce and a half, willow charcoal one ounce, ambergriſe, muſk, of each ten grains, make them into paſte with mucilage of gum tragacanth in roſe water, which make into rouls like candles, and dry for uſe.

A perfume to ſmoak and burn.] Take labdanum two ounces, ſtorax one ounce, benjamin, cloves, mace, of each half an ounce, muſk, civet, of each ten grains, all in fine powder, make up into cakes with mucilage of gum tragacanth in roſe-water, which dry; and keep among your cloaths, which when occaſion requires, you may burn in a chafing diſh of coals.

Another ſmoaking perfume to burn.] Take labdanum two drachms, ſtorax one drachm, benjamin, frankincenſe, white amber, xylo-aloes, of each two ſcruples, ambergriſe, muſk, of each five grains, make all into cakes as aforeſaid.

Another very excellent.] Take ſtorax, benjamin of each one ounce, wood of aloes half an ounce, ambergriſe, muſk, civet, balſam of Peru, oil of rhodium, of each two ſcruples, ivory burnt black a ſufficient quantity, powder what is to be powdered, and mix all together; which make into a paſte, with the ivory black and the mucilage aforeſaid; make little cakes and dry them, which keep in glaſſes cloſe ſtopt for uſe.

Another very good, but of leſs coſt.] Take olibanum one pound, ſtorax calamita and liquida of each eight ounces, labdanum ſix ounces, willow charcoal a ſufficient quantity, with mucilage of tragacanth, make a paſte as aforeſaid.

A ſweet perfume to burn.] Take ſtorax calamita, benjamin, of each an ounce; labdanum ſix drachms, muſk five grains, put them into a mortar, heat ſo hot, that by beating with a little peſtle, they may work together like wax, which make into little cakes or balls, and keep them for uſe.

A burning perfume for a chamber.] Take benjamin, maſtich, of each an ounce; ſtorax calamita, gum anime, amber, of each half an ounce; time, ſweet marjoram, lignum aloes, yellow ſanders, of each two drachms; all being in powder, with gum tragacanth diſſolved in roſe-water make a maſs for cakes or balls.

Another for the ſame.] Diſſolve gum tragacanth in damaſk-roſe-water, and make it into a paſte with labdanum, ſtorax calamita, benjamin, amber, of each two drachms; lignum aloes, lignum rhodium, of each two ounces; all being in powder, mix, and make cakes.

Another for the like intention.] Take benjamin, ſtyrax calamita, amber, all in powder, of each half an ounce; lignum aloes, yellow ſanders, of each ſix drachms in powder; make them into paſte with gum tragacanth diſſolved in roſe-water, which form into cakes, and dry them for uſe.

A perfume called amber paſte.] Take ſtorax calamita, two ounces; Florentine orrice, amber ana, an ounce and half; nutmegs, an ounce; musk, a ſcruple; being in powder, make a paſte with gum tragacanth diſſolved in roſe-water.

A boiling perfume.] Fill a ſilver or earthen pan with damask roſe-water, adding cloves well bruiſed half an ounce, bay-leaves two drachms; put them over the fire, and as it waſtes, fill up with freſh roſe-water.

King Henry, his perfume.] Take damask roſe-water a pint, cloves bruiſed, yellow of lemons, of each half an ounce; musk ten grains; boil all in a perfuming pan, with two drachms of white ſugar.

King Edward. his perfume.] Take damask roſe-water a pint, ambergriſe a ſcruple, civet ten grains, mix in a perfuming pan, ſetting it over ſoft embers.

The French queen's perfume.] Firſt burn chips of Cypreſs in the chamber a pretty while, the doors and windows being ſhut; then take damask roſe-water a pint, white ſugar candy an ounce, put them into a perfuming pan, and let them boil ſoftly on embers.

The animal perfume of Paracelſus.] Take cow-dung in the month of May or June, and diſtil it balneo; and the water thereof will be an excellent perfume, and have the ſcent of ambergriſe.

Lard muſkefied, a great perfume.] Take hogs-lard very pure one drachm, musk, civet, of each half a drachm, mix them well for boxes.

The mineral perfume of antimony.] Diſſolve antimony in oil of flints, cryſtal, or ſand, coagulate the ſolution into a red maſs, put thereon ſpirit of urine, and digeſt till the ſpirit is tinged; pour it off, and put on more, till all the tincture is extracted; put all the tinctures together, and evaporate the ſpirit of urine in balneo; and there will remain a blood-red liquor at bottom; upon which put ſpirit of wine, and you ſhall extract a very pure tincture ſmelling like garlick; digeſt it a month, and it will ſmell like balm; digeſt it a while longer, and it will ſmell like musk or ambergriſe. Beſides being a perfume, it is an excellent ſudorifick, and cures the plague, fevers, lues venerea, &c. After the ſame manner, you may make as ſubſtantial a perfume, of ſulphur or brimſtone.

Of the adulteration of muſk, civet and ambergriſe.] By reaſon that theſe choice perfumes are often adulterated or counterfeited, we ſhall do our endeavour to diſcover the cheat, leaſt any being deceived thereby ſhould ſuffer loſs. *Muſk is often adulterated* by mixing nutmegs, mace, cinnamon, cloves, ſpicknard, of each alike in a fine or impalpable powder, with warm blood of pigeons, and then dried in the ſun, then beaten again, and moiſtened with musk-water, drying and repeating the ſame work eight or ten times; adding at laſt a quarter part of pure musk by moiſtning and mixing with musk-water; then dividing the maſs into ſeveral parts, and rolling them in the hair of a goat, which grows under his tail.

Others adulterate it thus.] By filling the musk cods with goats blood, and a little toaſted bread, mixed with a quarter part of musk, well beaten together. The cheat is diſcerned by the brightneſs of the goats blood.

Or thus.] Take ſtorax, labdanum, powder of xylo-aloes, of each four ounces; musk and civet, of each half an ounce; mix all together with roſe-water. The cheat is diſcerned by its eaſy diſſolving in water, and its different colour and ſcent.

Or thus.] Take goats blood, powder of angelica roots, musk, of each alike, make a mixture.

To adulterate civet.] Mix with it the gall of an ox, and ſtorax liquified and waſhed; or you may adulterate it by the addition of honey of Crete.

To reſtore the loſt ſcent to muſk, or ambergriſe.] This is done by hanging it ſome time in a jakes, or houſe of office; for by theſe ill ſcents its innate virtue and odour is excited and revived.

To perfume ſkins or gloves.] Put a little civet thereon here and there, (if gloves, along the ſeams) then waſh in roſe or musked water four or five times, or ſo long as that they ſavour no more of the leather, preſſing them hard every time; then lay them in a platter, covered with the ſaid water, mixed with powder of Cypreſs, a day or two; take them out, preſs them and dry them in the ſhadow; being half dry, beſmear them a little with civet mixed with oil of jaſmine or ben, on the inward ſide chafing them with your hands before a fire, till you think that the civet hath pierced or gone through the leather; leaving them ſo a day or more; then rub it with a cloth that the gloves or leather may grow ſoft; leaving them ſo till they are almoſt dry, being drawn and ſtretched out; then hold them over ſome burning perfume to dry, and wetting them again with musk-water, do thus twenty times; laſtly, take musk and ambergriſe a ſufficient quantity, which mix with oil of jaſmine, benjamin or ben, diſſolve at the fire with a little perfumed water, with which (with a pencil) ſtrike the gloves or leather over on the outſide; beſmearing the ſame with civet: laſtly, lay them for ſix or eight days between two matraſſes, ſo will the skins or gloves be excellently perfumed.

Another way very excellent.] Take three pints of wine, ſheeps ſuet or fat one pound, boil them together in a veſſel cloſe covered, this done, waſh the greaſe ſix or ſeven times well with fair water, then boil it again in white-wine and roſe-water, of each one pound and a half, with a ſmall fire, till the half be conſumed; then take the ſaid greaſe, to which put pulp of ſweet navews roaſted half a pound, boil all in roſe-water half an hour, then ſtrain it, and beat it in a mortar, with a little oil of jaſmine and musk, with which beſmear your gloves (after due waſhing as aforeſaid) rubbing it well in by the fire.

Another way for gloves.] Waſh new corduban gloves, waſh them well three or four days, (once a day) in good muskified white-wine, preſſing and ſmoothing them well: laſtly, waſh them in musked water, letting them lie therein for a day, then dry them with care. This done, ſteep musk, amber, bazil of each one drachm in a quart of ſweet water, in which diſſolve gum tragacanth three drachms, boil all gently together, and in the boiling add zibet one ſcruple, with which beſmear the gloves, rubbing and chafing it in, then drying them according to art.

Or thus.] Firſt waſh the gloves or skins in white-wine, then dry them in the ſhade; then waſh them in ſweet water, mixed with oil of cloves, and labdanum, of each alike: laſtly, take musk, civet, ambergriſe, of each the quantity of ſix grains; oil of musk half a drachm; mucilage of gum tragacanth, fifteen grains; mix them well together in a mortar, which chafe into the waſhed gloves before the fire.

Or thus.] Take damask roſe-water muskified, *q. s.* put it into a pewter or earthen diſh, and lay the gloves in it one night and day, with a little turning now and then, and that they may be throughly wet; then take them out, and dry them carefully. Take cloves an ounce and half, in fine powder; mix it with the ſame water, and lay it upon the gloves, wetting them throughly, and dry them as before: take oil of ben or of almonds an ounce, musk half a drachm, ambergriſe a ſcruple, grind all well together upon a ſtone, with a few drops of the former water, with which anoint the ſeams, and chaſe it into the leather; laying many pairs one upon another, for ſome time, till they are throughly ſoaked, and then keep them carefully from the air.

Or thus.] Take oil of ſweet almonds, or of ben, which is better, two ounces; musk two drachms; ambergriſe half a drachm; oil of gloves chymical a drachm and half; grind all well together upon a porphyry, (the musk and amber being firſt in fine powder;) then digeſt two months, and keep it for uſe. Take damask roſe-water muskified, and wet your gloves therewith very well upon a board, then dry them; do this three or four times, and at laſt anoint them with the former oil; keeping them as the former, with this oil, you may anoint your hands, it will not only perfume them, but alſo make them ſoft and ſmooth.

Or thus.] Take oil of cloves two ounces, ſtorax calamita one ounce, benjamin half an ounce, cinnamon three drachms, musk half a drachm, ambergriſe a ſcruple, ſweet marjoram, time, of each fifteen grains, mix and grind them on a porphyry, to be uſed as the former oil, after waſhing of the gloves in damask roſe-water.

Or thus.] Take musk two drachms; ambergriſe one drachm; civet twelve grains; mix them together well; then add gum tragacanth, diſſolved in damask roſe-water muskified; grind all upon a ſtone till they are very fine and fully mixed; then lay it upon your gloves with a bruſh, being firſt waſhed in this following water. Take lye of wood-aſhes a pint and half; the yellow of a dozen oranges; Braſil and yellow ſanders in powder, of each an ounce;

alum a ſmall quantity; boil to the conſumption of a third part, ſtrain, and with a clean cloth or bruſh waſh over your gloves (being firſt waſhed in rain water from their alum and eggs) to colour them, four times; then being dry, apply to them the former oil.

Or thus.] Take muſk a drachm, ambergriſe half a drachm, civet ſix grains, grind them on a ſtone with oil of lemons, or with equal parts of oil of lemons, ſaſſafras and rhodium, with which your gloves (being waſhed as in the former) are to be perfumed by anointing them with a ſmall bruſh.

Cloths, linen or woollen, coffers, trunks, and the like.] Are beſt perfumed (with little coſt) with the ſmoak of burning perfumes, after which you may ſprinkle them often with damaſk roſe-water muſkified, and anoint the corners and cloſures of the boards with ſome of the former oils.

To make red writing ink.] Take raſpings of Brazil one ounce, white lead, alum, of each two drachms, grind and mingle them, infuſe them in urine one pound, with gum arabick two ſcruples, or a drachm at moſt.

Another way to make red ink.] Take wine-vinegar two pounds, raſpings of Brazil two ounces, alum half an ounce, infuſe all ten days; then gently boil, to which add gum arabick five drachms, diſſolve the gum, ſtrain, and keep it for uſe. Note, two drachms of the gum in ſome caſes may be enough.

[*I forbear here to give a receipt for preparing a moſt exquiſite* BLACK WRITING INK, *having ſold the property of it to the printer, who intends ſhortly to offer it to the public ready prepared, at the ſame rate of the ordinary ſort of black ink. It is free from the ill qualities of the common black writing ink, made of galls and copperas, ſuch as growing thick, drying up, looſing the colour, and moulding. I had it from the late celebrated* Rocquart *a German chymiſt.*]

To make green ink to write with.] Make fine verdigriſe into paſte with ſtrong vinegar, and infuſion of green galls, in which a little gum arabick hath been diſſolved, let it dry, and when you would write with it, temper it with infuſion of green galls aforeſaid.

Another way to make green ink to write with.] Diſſolve verdigriſe in vinegar, then ſtrain it, and grind it with a little honey and mucilage of gum tragacanth, upon a porphyry ſtone.

To make blue ink to write with.] Grind indigo with honey mixed with glair of eggs or glew-water, made of iſing-glaſs diſſolved in water, and ſtrained.

To make red writing ink of vermilion.] Grind vermilion well upon a porphyry ſtone, with common water; dry it and put it into a glaſs veſſel, to which put urine, ſhake all together, let it ſettle, then pour off the urine; and putting on more urine, repeat this work eight or ten times, ſo will the vermilion be well cleanſed; to which put glair of eggs to ſwim on it above a finger's breadth, ſtir them together, and ſettling abſtract the glair; then put on more glair of eggs, repeating the ſame work eight or ten times alſo, to take away the ſcent of the urine: laſtly, mix it with freſh glair, and keep it in a glaſs-veſſel cloſe ſtopped for uſe. When you uſe it, mix it with water or vinegar.

To make printers black.] This is made by mingling lamp-black with liquid varniſh, and boiling it a little, which you may make thick at pleaſure. You muſt make it moiſter in winter, than in ſummer; and note, that the thicker ink makes the fairer letter. If it be too thick, you muſt put in more linſeed oil, or oil of walnuts, ſo may you make it thicker or thiner at pleaſure.

To make red printing ink.] Grind vermilion very well with the aforeſaid liquid varniſh or linſeed oil.

To make green printing ink.] Grind Spaniſh green with the ſaid varniſh or linſeed oil as aforeſaid; and after the ſame manner, may you make printers blue, by grinding azure with the ſaid linſeed oil.

To make red ſoft wax.] Take white bees-wax one pound, turpentine three ounces, vermilion in powder well ground, oil olive, of each one ounce, melt the wax and turpentine; let it cool a little, then add the reſt, beating them well together.

To do the ſame otherwiſe.] This is done by taking away the vermilion, and adding inſtead thereof red lead three ounces, to the former things.

To make green wax.] Take wax one pound, turpentine three ounces, verdigriſe ground, oil olive, of each one ounce; compleat the work as before directed.

To make black wax.] Take bees-wax one pound, turpentine three ounces, black earth, oil olive, of each one ounce; mix and make wax as aforeſaid.

To make wax perfumed.] This is done by mixing with the oil olive aforeſaid, muſk, ambergriſe, or any other eminent perfume, as oil of cinnamon, adeps roſarum, or the like one drachm, more or leſs, accordiug as you intend to have its ſcent extended.

After the ſame manner you may make ſoft wax of all colours, having what ſcent you pleaſe; by mixing the ſcent intended, with the oil olive, and putting the colour in, in place of the vermilion.

To make hard ſealing-wax.] Take pure fine gum-lack, melt it in an earthen veſſel, and put into it a ſufficient quantity of the colour you deſign your wax to be of, ſtir and mingle it well, then take it off the fire, and when it is a fit heat, you may make it up into rolls or ſticks. To make red wax, you muſt colour it with vermilion. Blue wax, with blue bice, ſmalt, or ultramarine. Green wax, with green bice, verdigriſe, or ſome other mixture of that colour. Blax wax, with ivory or cherry-ſtone black. Purple wax, or of a dark red, with prepared caput mortuum, Indian lake, &c. *See in page* 43, *another method of making ſealing-wax.*

To make mouth gum.] Diſſolve iſinglaſs in fair water in a gentle balneo, then ſtrain it through a wide hair ſieve, whilſt it is hot, upon another coarſe and cloſe hair ſieve; when it is cold it will be thick like jelly; cut it into long handſome pieces, which put on a ſtring, ſo that they touch not one another, and hang them in the ſun till they are dry. You may give it a fine taſte and ſmell, by mixing ſweet and odoriferous things with it.

Another kind of ſtrong glew for pipes and aqueducts.] Tobacco pipe clay, dried and reduced to powder, and mixed with good ſtore of ſhort flocks, and beat up with linſeed oil to a ſtiff paſte, like kneaded dough, makes a ſtrong and laſting cement for pipes, and aqueducts; and being made into pipes (though long a drying) is very ſtanch and laſting.

To make a very ſtrong glew.] Soak the fineſt ichthyocolla (that is iſinglaſs) twenty-four hours, in ſpirit of wine, or common brandy; then boil all very gently together, continually ſtirring of it, that it burn not, ſo long till it becomes one liquor or body (ſave ſome ſtrings not very diſſolvable) which ſtrain whilſt hot, through a coarſe linen cloth, into a veſſel where it may be kept cloſe ſtopped; a gentle heat will melt this glew into a tranſparent liquor, with which you may glew things ſo ſtrongly together, that they will rather break in any other part, than in the place glewed; it much exceeds the common glew.

Of the various ways of making artificial pearls. The firſt way.] Diſſolve mother of pearl in ſpirit of vinegar, then precipitate it with oil of ſulphur per campanam (not with oleum tartari, for that takes away the ſplendor) which adds a luſtre to it; dry the precipitate, and mix it with whites of eggs, of which maſs you may make pearls, of what largeneſs you pleaſe, which before they be dry, bore through with a ſilver wire, ſo will you have pearls ſcarcely to be diſcerned from thoſe which are truly natural.

The ſecond way.] Take chalk, put it into the fire, letting it lie till it breaks; grind it impalpable, and mix it with whites of eggs, of which form pearls, boring them as aforeſaid; dry them, then wet and cover them with leaf ſilver.

The third way.] Take prepared crabs-eyes ground into impalpable powder, and with glair make pearls; which bore, as aforeſaid; dry them, and boil them in cows milk; then in the ſhade (free from duſt) dry them well; they will pleaſe.

The fourth way.] Take potters earth, and make them of what form you pleaſe; dry them in the ſun, or in the gentle heat of a furnace; then wet them with glair of eggs, lightly coloured with bole-ammoniack, and cover them with leaves of ſilver, being firſt wet with water; when they are dry, poliſh them with a tooth, and they will be oriental. Then take bits of parchment, and waſh them in warm water, till the water grows ſomewhat thick, boil and ſtrain it, and uſe it warm; then faſten each pearl through its hole upon a fine piece of wire, and plunge them into the water of parchment, taking them out again; then turn them round, that the glewy liquor may equally cover them; thus the ſilver whiteneſs will be the better ſhine through, ſo that the pearls will ſeem to be truly natural, and being compared, will rather exceed.

The fifth way.] Calcine muſcle and ſnail ſhells in a crucible, till they are very white, even as ſnow; with glair make pearls, which bore as aforeſaid, dry them in the ſun; dip them in red wine, dry them again, and they will be fair.

The ſixth way.] Take ſublimate two ounces, tin-glaſs one ounce, mix them, and ſublime them together, and you will have a ſublimate not inferior to the beſt orient pearls in the world, of which, with glair, you may form what you pleaſe.

The ſeventh way.] Take any of the aforeſaid particulars, and mix them (inſtead of glair) with ground varniſh (made of gum animæ, and the alcool of wine) of which make pearls; theſe will in all reſpects be like the natural; for theſe will no more diſſolve in water, than the truly natural; which all thoſe that are made of glair of eggs, are unavoidably ſubject to.

The eighth way.) After diſſolution, precipitation, edulcoration, ſiccation and formation, put the pearls into a loaf of bread, and bake it in the oven with other bread, ſo long till the loaf is much burnt, then take them out, and waſh them, firſt in good juice of lemons, then in clear ſpring-water; and they will be as fair as the truly natural. Or after baking, give them to pigeons to eat, keeping them cloſe up, and in the dung you will find the pearl exceeding fair: where, note, you muſt give the pigeons nothing to eat in three days time.

The ninth way.] After diſſolution of ſmall oriental pearls in juice of lemons, make the form thereof with clarified honey, moiſtning your hand with aqua mellis; this done, perfect them as before.

The tenth way.] Take filtrated juice of lemons, powder of pearl, of each ſix ounces, talk one ounce, put them into a glaſs, and ſtop it cloſe, ſet it fifteen days in horſe-dung, and it will be a white paſte; of which form pearls, bore them, and dry them in the ſun; at laſt in paſte of barley meal (viz. a barley loaf) four fingers thick, ſtick the pearl, ſo that they may not touch, ſtop the holes, and cover them with paſte; ſet it into an oven and bake it with bread, and you will find them hard and clear.

The eleventh way.] Having formed them of the matter intended, bored and dried them, put them into quickſilver, ſet over a glowing heat, ſtirring them well about, that the quickſilver may ſtick to them; then dip them into glair of eggs, upon a glowing heat, and they are done; or being dry, boil them in linſeed oil, and waſh them in warm water.

The twelfth way] Take pearl three ounces, prepared ſalt one ounce, filtrated juice of lemons, ſo much as will cover them four fingers breadth; let it ſtand ſo long till it be a paſte; the glaſs being very cloſe ſtopped, ſhake all together five or ſix times a day; and when it comes to paſte, put it into a glaſs with ſtrong ſpirit of vinegar, lute another glaſs over it; digeſt it three weeks in a cool place under the earth, ſo long till all be diſſolved, then mix it with a little oil of eggs, or ſnail-water, till it be like pearl in colour; then put this paſte into ſilver moulds and cloſe them up for eight days; after which take them out, and bore them as aforeſaid, and put them again into the mould for eight days; this done, boil them in a ſilver porringer with milk: laſtly, dry them upon a plate, in a warm place, where neither wind nor duſt may come, and they will be much fairer than any oriental pearl.

The thirteenth way.] After the preparation of the matter in juice of lemons, or aquafortis, with clean hands make them into paſte, and waſh them in diſtilled water, which put into edulcorate calx of ſilver, and digeſt in horſe-dung for a month, ſo will they be fair and very oriental.

The fourteenth way.] Diſſolve the matter in aquafortis (which let over-top it a finger's breadth) in a glaſs gourd, till all be incorporated into one body, which put into ſilver moulds, which have holes thro' them, and having ſtood one day, bore them through the holes, as they lie in the mould with a ſilver needle; being quite dry, take them out, put them into a glaſs cloſe covered in the ſun, till they be quite dry; then put them upon a ſilver wire; and let them lie covered in their own fat, (that is, that fatty ſubſtance, which ſwims on the top of the menſtruum in their diſſolution) ſo long till they are very fair, then being ſtrung, put them into a glaſs egg, and let them ſtand nine days in digeſtion, and they will be as fair as the natural.

The fifteenth way.] Take tobacco-pipe clay, of which form little beads, as before directed, dry them in the ſun, and burn them in a potter's furnace, then cover them with bole-ammoniack, tempered with whites of eggs; being dry, dip them in water, lay on leaf ſilver, which dry again, and poliſh them with a tooth; then take clean ſhavings of parchment, cut ſmall and waſhed well with warm water; boil them in a new pot, with a ſlow fire till they become ſomewhat thick, ſtrain it, and being warm, put in the pearl upon a needle or fine wire, that the hole may not be ſtopped, take them out, turn them round, that the water or glew may not ſettle in one place, dipping them ſo often (drying them every time) till they be thick enough, and they will appear full as fair as the truly natural.

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The ſixteenth way.] Take the impalpable and ſnow-white calx of talk, and with the beſt varniſh make a paſte; of which form pearls, and bore them with a ſilver wire, on which let them dry; this done, make a mixture of the alchool of the incomparably pure red diaphoretick, mercury, calx of talk aforeſaid, ſhell gold and ſilver, as before directed, in a juſt and due proportion (as by many trials you may find out) in which roul your pearls till they be all over perfectly covered, then varniſh them with the aforeſaid varniſh, which let dry according to art, and if need be, poliſh with the impalpable powder of putty and water.

The ſeventeenth way.] Take mercury and the fineſt pewter, of each one pound; make an amalgama, which waſh ſo well, till the blackneſs is gone, make it into little cakes, and lay them on a marble ſtone; then take mercury ſublimate two pounds in very fine powder, and ſtrew it upon the cakes; put them on a glaſs diſh, and ſet them in a very moiſt cellar to diſſolve into an oil, which rectify by a glaſs helm in balneo mariæ, and ſo there will be drawn off by a gentle fire a mercurial water. Then take of the beſt ſmall oriental pearls, one ounce; put them into the mercurial water, and in two or three days they will be reduced to a paſte, which in a ſilver mould, you may form into pearls of what bigneſs you pleaſe. At the ſame time you muſt hole them with a ſilver wire. Then put them, when they are moulded, into a new crucible, but ſo that they touch not one another; the top of the crucible being well covered and luted cloſe; ſo ſet them in a glaſs-maker's annealing furnace, till they be very hard, which will be in a little time. Afterwards make a pye of flower, let it be very thick, and take the hardened pearls putting them on a ſilver wire, and ſo fix them in the pye, that they touch not any part of it, nor one another. Laſtly, put the pye, made cloſe up, into an oven of bakers houſhold bread, and let the pye ſtand all the time that the bread is baking; after which you will find the pearls to be as well coloured as the beſt oriental.

Of the nature and compoſition of GLASS: and the art of counterfeiting Gems of every kind.

Of Glaſs in general.

BY glaſs, as here treated of, is to be underſtood, the artificial vitrifications of bodies, made to anſwer ſome uſeful purpoſe, either in domeſtic neceſſaries, or other articles of commerce: and the obſervations and directions given with regard to it, in this treatiſe, are ſuch only as reſpect the improvement of the art of preparing and compounding the kinds applicable to theſe ends in the different manufactures of it. For the more ſpeculative and philoſophic diſquiſitions on its nature are avoided, where they lead to no principles that are capable of being applied to practice. The methods of modelling and forming it into all the variety of veſſels, and other figures, into which it is wrought, are likewiſe omitted: becauſe they are already, or may be by other means, well known to thoſe who have any concern with them as an employment; or like all other occupations of artiſans, may be much more eaſily and better learnt by ſuch as are deſirous to be initiated into an operative knowledge of them, from an inſpection of actual works, and trials to intimate what is there to be ſeen done, than they can by the moſt explicit verbal directions.

The manufactured glaſs at preſent in uſe may be divided into three general kinds, white tranſparent glaſs, coloured glaſs, and common green or bottle glaſs. Of the firſt kind, there is a great variety of ſorts, according to the ſeveral purpoſes intended to be ſerved by it, either for making domeſtic utenſils, or lights for incloſed places: and of the ſecond, there is likewiſe a ſtill greater multiplicity of ſpecies, differing in their colour, or other properties, according to the occaſions for which they are wanted: but of the laſt, there is no diſtinguiſhed difference of ſort; except what the accidental manner of preparation and management, practiſed according to the ſkill or art of particular directors of manufactories, may occaſion.

In order, however, to ſpeak more intelligibly of the nature of the manufactured glaſs, to be here treated of, it is proper to give ſome diſtinct notion of vitrification in general. But I ſhall not endeavour to puſh the matter to thoſe almoſt metaphyſical lengths to which Becher, Stahl, and others, have endeavoured to carry it; even far beyond the conclusions which can be ſupported by inductions from ſufficient experiments. Vitrification then (accordin to the more general and obvious notions of its na ture) is a change which may be wrought in mo kinds of fixt bodies, or rather in all under ſome circumſtances, by the means of heat, applied in various degrees, according to the various nature of the bodies: from which change, they become fluid; and continue ſo while kept in the ſame, or any greate degree of heat; and, when become cold, acquir tranſparency, fragility, a great but not abſolute degree of inflexibility, a total want of malleability and inſolubility in water. All theſe qualities are inſeparably attendant on perfect vitrification: thoug there may be many preparations of artificial glaſs even among thoſe that are in common uſe, in whic ſome of them are wanting. But this is, nevertheleſs only where the vitrification is immature; or whe there is an admixture of other bodies with the vitri fied matter: as in the caſe of the opake white glaſs in which the matter giving the milky colour is in a unvitrified ſtate, and conſequently deſtroys the tra ſparency; or, in the compoſitions where too grea proportion of ſalts is uſed, when the glaſs produc will be ſoluble in water, though perfect with reſp to all the other qualities. In both theſe caſes the is the preſence of an heterogeneous body, beſi the proper glaſs; and therefore, if the whole m be conſidered as in a vitrific ſtate, it muſt be deemed to be in an imperfect one, though the compoſition, in the inſtance of the white glaſs, be adapted by this very circumſtance to the œconomical purpoſe for which it is intended. The ſame principle will be verified on a due examination in all the other ſorts of manufactured glaſs, as well as in accidental commixtures, where the appearances of the glaſs diſagree with the ſyſtem of qualities required, in the above given definition, to the perfect conſtitution of glaſs.

From the nature of vitrification, it therefore appears, that all fixed bodies are capable of being the materials of perfect glaſs under ſome circumſtances. But as the means of vitrification are limited with regard to the manufactured glaſs, ſuch bodies only are proper to become the ingredients of the perfect kinds of it, as are eaſily to be procured in due quantity, and admit of being vitrified by the heat of a furnace either alone, or by their commixture with others, which may promote this change in them : and in the caſe of the imperfect ſorts, ſuch as that abovementioned, bodies that are not capable of being vitriated, by the means there employed, are alſo taken in as materials : where they are required to give the particular properties wanted in each peculiar ſort. The principal ſubſtances, therefore, that are choſen for the compoſition of manufactured glaſs, are, ſand, flints, and other foſſile bodies of a ſtony and earthy texture ; metals and ſemi-metals of all kinds previouſly prepared by calcination, or other operations ; arſenic and zaffer, which are prepared parts of a foſſile ; and all ſalts of a fixt kind.

Among theſe ſubſtances there are ſome, which are ſtrongly reluctant to the vitreous fuſion, and could ſcarcely alone be ever converted to glaſs ; at leaſt not by the heat of any furnaces ; and yet are ſuch, as are moſt capable of giving firmneſs and tenacity to that in which they are admitted ; as alſo of being more copiouſly provided at a ſmall expence. There are others, on the contrary, that vitriſy in a much leſs heat than that commonly employed in the working of glaſs; and have likewiſe this attendant property along with their own proneneſs to vitreous fuſion, that they accelerate and produce it in many of thoſe that are otherwiſe more repugnant to it; and cauſe them, by their commixture, to vitrify in a greatly leſs degree of heat than they otherwiſe would. This property of promoting vitrification is called technically fluxing the bodies on which they ſo act; and on the proper application of this principle to practice lies the main ſtreſs of ſkill in the art of compounding glaſs; as the ſavings in the original coſt of the ingredients, in time and in fewel, as well as the qualities of the glaſs produced, depend chiefly on the thorough intelligence, in this view, of the nature of the bodies, proper to become ingredients of it. The next important relation, in which bodies ſtand with reſpect to the compoſition of glaſs, is the effect they may have on its colour by their admixture: in order to deſtroy all kinds of which in ſome caſes, and to produce them in others, ingredients are frequently added, that are not otherwiſe neceſſary; as being no way ſubſervient to the general view. This conſtitutes, therefore, the other great object of skill in the art of making glaſs: for the knowing properly how to take away all colour from the tranſparent white glaſs, and to impart any kind deſired, to proper compoſitions on other occaſions, is of the next great moment to the being able, by the moſt cheap and eaſy means, to procure a due vitrification.

According to the above ſpecified intentions, in which the ſeveral ſubſtances ſerving for the materials of glaſs are uſed, they may be properly diſtinguiſhed into three kinds, as making the body, flux, and colorific matter.

The ſubſtances which have been employed in forming the body of glaſs are ſand (by which is only to be underſtood the white kinds) flints, talc, ſpar, and ſeveral other ſtony foſſiles. All theſe vitrify of themſelves too ſlowly, to produce perfect glaſs by the degree of heat that can be applied to them when in larger maſſes: which makes them therefore require the addition of thoſe other kinds, whoſe fluxing power may remedy this defect in them: while they, on the other hand, being of low price, and to be procured in unlimited quantities, and giving that hardneſs, ſtrength, and inſolubility, which cannot be had in any glaſs, formed of other ſubſtances without them, are yet eſſential and indiſpenſibly neceſſary ingredients in all kinds of manufactured glaſs.

The ſubſtances, which are uſed as fluxing ingredients in glaſs, are, red-lead, pearl-aſhes, nitre, ſea ſalt, borax, arſenic, the ſcoria of forges, commonly called clinkers, and wood-aſhes containing the calcined earth and lixiviate ſalts, as produced by incineration. The preſence of ſome of theſe bodies is always equally neceſſary with that of thoſe which form the body, in all the compoſitions of manufactured glaſs. But the uſe of them, both with reſpect to choice and proportion, is greatly varied in different works; even where the ſame kind of glaſs is intended to be produced: as the general nature of them has never been hitherto underſtood by the directors of ſuch works; and they have only implicitly followed the beſt receipts they could procure, carefully keeping them ſecret, when they happened either by communication or their accidental diſcovery to be poſſeſſed of ſuch improvements, as gave them any advantages over their fellow operators.

The ſubſtances, which have been applied as colorific matter in manufactured glaſs, are extremely numerous and various; as all the ſpecies of metals and ſemi-metals, with many other mineral and foſſile bodies, have been uſed for the producing ſome colour or other; and make a large field of ſpeculative and practical knowledge. The art of ſtaining glaſs, with all the variety of colours in the greateſt degree of force and brightneſs, is not however of ſo much importance commercially conſidered, as the knowing how to baniſh and exclude, with eaſe and certainty, the colours which of themſelves ariſe in moſt of the

compoſitions

compoſitions for glaſs intended to be perfectly tranſparent and colourleſs. For this laſt purpoſe, nitre and magneſia are the principal ſubſtances employed, in the manufactures of this country; and extremely well anſwer the end: though not without enhancing the expence of the glaſs by the uſe of the firſt; and in a ſmall degree injuring its tranſparency by that of the latter; as may be demonſtrated by principles that are unqueſtionable in themſelves, though wholly unknown to thoſe who are practically concerned in theſe matters.

From theſe three kinds of ſubſtances, duly combined together by commixture and adequate heat, or in ſome caſes from the two firſt only, all the ſorts of manufactured glaſs at preſent in uſe are formed. The general manner of doing which is to reduce thoſe kinds of bodies, that are in groſſer maſſes, to powder; and then, all the ingredients being thoroughly well mixt together by grinding, and put into proper pots, to place them in a furnace where the heat is ſufficient to bring them to a due ſtate of fuſion; in which they are to be continued till the vitrification be completed.

This proper degree of vitrification muſt be diſtinguiſhed by the tranſparent and equal appearance of the matter, when a ſmall portion is taken out and ſuffered to cool: except in the caſe of thoſe ſorts where the glaſs is not perfect, with regard to which, a judgment muſt be made from their having attained or wanting that peculiar appearance, which the particular ſort is required to have. It may be proper to ſubjoin, that in all caſes, the vitrification is ſooner and more eaſily made perfect in proportion as the ingredients are reduced to the ſtate of a finer powder, and more intimately commixt.

Of the materials ſerving for the body of glaſs.] The materials employed to give a body to glaſs are, ſand, flints, talc, ſpar, and ſome other ſtony and terrene foſſiles.

Sand is, at preſent, almoſt the only kind of ſubſtance which is uſed in this intention in the Britiſh manufactures of glaſs; and with great reaſon, as it extremely well anſwers the purpoſe; and does not demand the previous preparation of calcination, that is neceſſary with reſpect to flints and other ſtones; and as it can be with certainty procured in any quantity demanded. The kind of ſand moſt fit for making the white tranſparent kinds of glaſs, is that brought from Lynn in Norfolk, by the name of which place it is diſtinguiſhed: and there is alſo another kind of this, but inferior, brought from Maidſtone in Kent. It is white and ſhining; and, examined by means of a microſcope, appears to be ſmall fragments of rock chryſtal; from which it does not ſeem, by any experiments, to differ in its qualities; and the glaſs formed of it may, therefore, properly be conſidered as made of chryſtal. The introduction of the uſe of it into the manufactures of glaſs in this country has almoſt wholly ſuperſeded that of flints: from which it no way differs in this application, but in the being ſomewhat ſlower in vitrifying; which makes it require in proportion a greater ſtrength of flux and fire: but to compenſate for this diſadvantage, it is clearer in its own colour, and much freer from heterogeneous tinging bodies, which injure the colour of the glaſs; and frequently give embarraſſment where flints are uſed. The ſand requires no previous preparation for common and groſſer purpoſes; eſpecially where nitre is uſed; which burns out the ſulphureous matter from any filth of the nature of animal and vegetable ſubſtances; and conſequently calcines them to an earth no way injurious to the glaſs: but for nicer purpoſes, and where no nitre is uſed, it is proper to purify or cleanſe the ſand by waſhing: which may be thus done. Pour water upon it; and, having ſtirred them well about, incline the veſſel immediately, in ſuch manner, that the water may run off, and carry with it the filth that will float in it: by repeating which a few times, the ſand will be freed from all the heterogeneous matter that is lighter than itſelf. For coarſe glaſs, other kinds of ſand of a ſofter texture are uſed: as, beſides the advantage of being cheaper, they are more eaſily vitriable than flints; and conſequently make a ſaving in the fluxing bodies which are to be added to them.

Flints are the next important article in the ſubſtances which are uſed for forming the body of glaſs; and were indeed the only kind employed in larger works, where any better ſorts of glaſs were manufactured, before the uſe of the white ſand excluded them in all places where it is to be conveniently obtained. Since, for the reaſons above given, it is a more eligible material, unleſs for experiments, or where very ſmall quantities are required; in which caſe the calcined flints being more eaſily reduced to an impalpable powder, may poſſibly be more commodiouſly employed than the ſand. Flints yet, however, continue to be uſed wherever the proper ſand cannot be procured at a reaſonable charge, as the ſole ingredient for forming the body of the better kinds of glaſs: ſince they are, in moſt places where they are naturally found, to be had in extreme great quantities; and the expence of calcining them does not enhance their whole coſt to a degree beyond what the current price of glaſs may bear. The goodneſs of flints with reſpect to this uſe of them muſt be diſtinguiſhed by their clear tranſparent black colour; and all ſuch as are marbled with brown or yellowiſh colour ſhould be rejected, for fear of iron, which frequently lurks in them under that appearance, and is very injurious to the colour of glaſs if it get admiſſion into it. Such ſhould, therefore, be carefully pickt out when found in parcels of the clearer ſort; but if the greater part of any parcel appear ſo marked, it ſhould not be uſed till trial be made in a ſmall quantity, whether the diſcolouring be owing to any ſubſtance detrimental to the colour of glaſs or not. It is always neceſſary, that flints ſhould undergo a calcination before they be uſed in the compoſition of glaſs: as well becauſe they are not otherwiſe to be reduced to a texture, which will admit of their being powdered, in order to their due commixture with the other ingredients; as becauſe they are not ſuſceptible of vitrification till a proper change be produced in them by calcination. This calcination muſt be performed by putting them into a furnace of a moderate heat, being firſt dipt in water; and continuing them there till they become intirely white, even to the moſt interior part: which will require a greater or leſs time, according to their magnitude, and the degree of heat of the ſurnace. When they are thus rendered white, they muſt be taken out of the fire; and inſtantly immerſed in cold water; where they muſt remain, till they be again cold: and then they will be found, if duly calcined, to be cracked and ſhivered into flaky pieces; and to become ſo ſoftly brittle as to be eaſily reducible to powder. Some part will nevertheleſs be always found inſufficiently calcined; which may be diſtinguiſhed by their harder and more obdurate conſiſtence: and they muſt be carefully ſeparated, in order to be recalcined; as they will otherwiſe greatly retard and impede the powdering of the duly calcined parts. Thoſe which are properly calcined muſt then be levigated, by means of mills or other implements, accordingly as the quantity or opportunity may make it expedient; and they will then be fit for uſing in the compoſitions for glaſs.

Talc of various ſpecies has been likewiſe uſed in the ſame intention as ſand, and flints: but ſeldom in large works. It ſometimes requires a calcination, in order to its due preparation for entering into the compoſition of glaſs: but neither ſo great a heat, nor the quenching in cold water, are neceſſary for bringing it to a proper texture to bear powdering. Some ſorts of talc are much more quickly vitrifiable than others; and, fuſing eaſily with either ſalt of tartar or lead, may therefore be uſed in default of flint, or ſand ſufficiently white. But, with reſpect to larger manufactures, the uſe of flints is more eligible; as they are to be procured in great quantities with more certainty; and will, in general, require much leſs flux and fire to bring them to a due ſtate of vitrification.

Several other, both earthy and ſtony, foſſiles, have been likewiſe uſed for forming the body of glaſs: and it has been obſerved, that moſt kinds of ſtony ſubſtances, which will ſcintillate or ſtrike fire with ſteel, are vitriable within the degree that fits them for this purpoſe. But as they are neither uſed at preſent, nor promiſe to be any way advantageous in practice, as far as is hitherto known of them, I ſhall omit enumerating them; as being foreign to the purpoſe in hand: except with reſpect to two kinds. The one of theſe is called *moilon* by the French; and is found in great quantities, as an upper cruſt in many freeſtone quarries: and, as it may be uſed without any previous preparation, and is very quickly vitrifiable, may be ſerviceable, on ſome occaſions, to thoſe who may want to form glaſs, or vitreous compoſitions, where this may be procured with more eaſe than any of the before-mentioned ſubſtances. The other is the white round ſemi-tranſparent river pebbles, which vitrify very ſoon; and, if choſen colourleſs, make a very white glaſs; but they muſt be calcined, as the flint, by putting them into the fire till they be red hot; and then quench them in cold water, in order to bring them to a ſtate fit to undergo powdering.

Kunckel confounds the calcined flints, and all other ſtones uſed for making glaſs, under the name of ſand, in his receipts; notwithſtanding he admits of a great difference in their readineſs to be vitrified: as in the caſe of calcined flints, and the ſofteſt kind of natural ſand; where one hundred and forty pounds of ſalt are required to a hundred and fifty pounds of the calcined flints; and only one hundred and thirty pounds of ſalt to two hundred pounds of the ſand.

Of the materials uſed as fluxes in the compoſition of glaſs.] The materials uſed for the fluxes in the compoſition of manufactured glaſs, are, lead; pearl-aſhes; nitre; ſea ſalt; borax; arſenic; ſmiths clinkers;

ers; and wood-aſhes containing the earth and lixiviate ſalts as produced by incineration.

Lead is the preſent moſt important flux in the Britiſh manufactures of what is called flint glaſs: but it muſt be brought, by previous calcination, to the ſtate of minium, or what is called red-lead. This, uſed in a due proportion, makes a tougher and firmer glaſs than can be produced from ſalts alone: and is yet procured at a very ſmall expence. But all the glaſs formed of lead is tinged originally with yellow; and therefore requires the addition of nitre to burn and deſtroy the ſulphur or phlogiſtic matter it contains, in order to bring it to a more colourleſs ſtate: which addition of nitre enhances again the coſt of glaſs ſo compoſed, that would otherwiſe be extremely low. There is another reaſon, likewiſe, for the addition of nitre, or ſome other ſalt, to operate as a flux in the glaſs compounded with lead; which is, that there may not be a neceſſity of uſing beyond a certain proportion of it. For, if glaſs have much lead in its compoſition, it will ſuffer a corroſion by the air; which gives a greyiſh dulneſs to its ſurface, that is very injurious both to its beauty and utility. It is needleſs here, to teach the manner of calcining lead; becauſe it is done in works appropriated to that purpoſe; and is ſold by the proprietors of theſe works, at a cheaper rate than any particular perſons could pretend to manufacture it for their private uſe. The perfection of red lead lies in its being thoroughly well calcined; which is beſt diſtinguiſhed by its redneſs, inclining to crimſon, and in its being pure; which may be judged of by the brightneſs of its colour. There is indeed no materials of a red colour cheap enough to adulterate it with, except powdered bricks, or ſome of the red okers; and they would immediately ſhew themſelves, in the vitrification of the ſmalleſt quantity, by the ſtrong yellow tinge they would give the glaſs.

Pearl-aſhes is the next leading article among the ſubſtances uſed as fluxes in glaſs: and they at preſent moſtly ſupply the place of the Levant-aſhes, the barillas of Spain, and many other kinds, which were formerly brought here, as well for making glaſs as ſoap. In the kinds of glaſs, were perfect tranſparency is wanted, as in looking glaſs plates, and all kinds of window-glaſs, ſalts are preferable as a flux to lead; and, conſequently, the pearl-aſhes become the principal matter of the flux. For, as all the lixiviate or fixt alkaline ſalts of vegetables are the ſame for this purpoſe, when pure, and thoſe called pearl-aſhes are purer than any other which can be provided at a moderate expence, the uſe of them is more expedient than of any other. This kind of fixt alkaline ſalts, called pearl-aſhes, is prepared in Germany, Ruſſia, and Poland, by melting the ſalts out of the aſhes of burnt wood; and, having reduced them again to dryneſs, evaporating away the moiſture, and calcining them for a conſiderable time in a furnace moderately heated. But, as they cannot be prepared with advantage in this country, (though in America they unqueſtionably might, and indeed are of late,) and are to be had at a reaſonable price by thoſe who may have occaſion to uſe them in making glaſs, I ſhall wave entering more particularly here into the detail of the proceſs, by which they may be beſt and moſt profitably produced; as not properly falling within the intention of this work. The goodneſs of pearl-aſhes muſt be diſtinguiſhed by the equal and white appearance of them; as it conſiſts in their purity, and their having been calcined for a long ſpace of time, of which the whiteneſs, and equal appearance, are marks; unleſs in the caſe of ſome parcels that contain lumps of a bluiſh caſt produced by the calcination; which diſcolouring is not, however, any proof of their being bad: but any browniſh caſt in particular parts, or greyneſs in the whole, is a certain criterition of their not being good. This muſt, however, be confined to ſuch as are perfectly dry; which can only well be on the opening the caſks they are brought over in: for, if the air have acceſs to them, they ſoon deliquiate, and look brown or greyiſh, from a ſemi-tranſparency they acquire in that deliquiating ſtate. There is one, and the moſt common adulteration, which is made in theſe ſalts, that is not eaſily diſtinguiſhable by the appearance; it is, the addition of common or ſea ſalt, to them; which is ſometimes copiouſly made. This is not, however, very detrimental in the application of them to the forming glaſs. But it is, nevertheleſs, a diſadvantage conſiderable enough in large concerns, to buy one thing for another at ſix times its current price. As it is expedient, therefore, to know how to diſtinguiſh this fraud, the following method is propoſed as eaſy and certain.

Take a ſmall quantity of the ſalt ſuſpected; and, after it has lain in the air ſo as to be a little ſoftened but not melted, put it in a fire-ſhovel and hold it over the fire where the heat is pretty ſtrong. If it contain any common ſalt, a crackling, and, as it were ſlight exploſion will follow, as the ſalt grows hot: which decrepitation is a certain mark of common ſalt wherever it is found.

The pearl-aſhes require no preparation; except where extreme great tranſparency is required, as in the caſe of looking-glaſs, and the beſt window-glaſs; in which caſes a purification is neceſſary, in the manner which will be ſhewn in ſpeaking of theſe particular kinds.

Nitre in its refined ſtate, in which it is commonly called ſalt-petre, has been formerly much uſed as a flux in the finer kinds of glaſs; and is now likewiſe employed in moſt compoſitions of the ſame nature. But this is a noted one by thoſe who are at all acquainted with the principles of the art, ſo much in the intention of a flux, as in that of a colorific ingredient; from its power of rendering glaſs colourleſs, by deſtroying the phlogiſton in lead, or in any vegetable or animal matter, which may tinge the glaſs; as we ſhall have occaſion to obſerve more particularly in its proper place. As a flux, it is leſs powerful than fixt alkaline ſalts of vegetables: and being dearer by much, its uſe would, therefore, be in proportion leſs expedient than that of pearl aſhes, if it were to be employed in this view only. The ſalt-petre that is uſed here is brought from the Eaſt-Indies, in the form of what is called crude nitre; and in commercial language rough-petre: in which ſtate it is commixt with ſome proportion of common ſalt. It is refined by perſons who make it their proper buſineſs; and bought for the purpoſes of glaſs making in the ſtate of ſalt-petre: on which account, it is unneceſſary to give the proceſs for refining it here. If it be obtained in chryſtals of ſuch a ſize, that the figure of them may be diſtinguiſhable, there is no hazard of any adulteration, but what would be very apparent; as no heterogeneous matter can be made a proper part of ſuch chryſtals; and, therefore, if they appear bright and colourleſs, the goodneſs cannot be doubted.

Sea ſalt is alſo frequently uſed as a flux in the making glaſs of various kinds; and it has a very ſtrong power in promoting vitrification even in ſome obdurate bodies; but, uſed in a large proportion, it does not produce ſo ſtrong and tenacious a glaſs as lead, or even the alkaline ſalts of vegetables; and is therefore only taken in aid of the others, when admitted as an ingredient. It ſhould be brought to a dry ſtate by decrepitation: that is, keeping it in a moderate heat, till it ceaſes crackling, before it be put with the other ingredients into the fuſing heat: otherwiſe, by the little exploſive burſts of its parts, it will drive ſome of the powdered matter out of the pot. It muſt not, after ſuch decrepitation, be again expoſed to the air; for, if it be, it will regain its former quality of crackling in a ſhort time.

Borax is the moſt powerful flux of all the ſalts, or, indeed, of any known ſubſtance whatever: but, on account of its great price, can only be admitted into the compoſition of glaſs deſigned for looking-glaſs plates, or other purpoſes, where a conſiderable value can be ſet on the produce; or where the quantity wanted is very ſmall. It is brought from the Eaſt-Indies, under the name of tincal; and the refinement of it in a perfect manner is hitherto known but to few perſons in Europe, who carefully keep it ſecret. The knowledge of it, however, is not important to the art of making glaſs; as it is always procured for that purpoſe in a refined ſtate; and not uſed in very large quantities. The purity of it may be aſcertained by the largeneſs and clearneſs of the chryſtals: for when it is had in that ſtate, it may be always concluded good. The previous preparation of borax for the compoſition of glaſs, is to calcine it with a gentle heat, which converts it to a flaky feathery kind of ſubſtance like calcined alum: after which it ſhould be ground to powder, and is then fit to be commixt with other ingredients. This calcination of borax ſhould be with a gentle heat, and in a very large veſſel proportionably to the quantity; for it ſwells and riſes in inflated bladders, ſo as to occupy a very great ſpace.

Arſenic is alſo a powerful flux; but muſt not be added, nevertheleſs, in too great quantity. For, though when once vitrified perfectly, it greatly promotes the ſame change in other ſubſtances, yet, when added in a redundant proportion, it turns the glaſs milky or opake; and keeps it in that ſtate a conſiderable time before it will duly aſſimilate; from whence the due vitrification is greatly retarded, ſo as to occaſion an intolerable loſs of time and fewel. Though the glaſs in all ſuch caſes would become clear, if continued long enough in the fire, yet, on this principle of its ſlowneſs in vitrifying when added to compoſitions of glaſs in a large proportion, it is uſed for giving an opake white colour to glaſs, as we ſhall ſee below.

Wood-aſhes, by which is to be underſtood, likewiſe, thoſe of broom, furze, or any other burnt vegetable, are uſed as a flux for the common bottle or green glaſs. The aſhes muſt be taken in their original ſtate, conſiſting of the calcined earth of the vegetable, and their lixiviate or fixt alkaline ſalt; as their virtue lies in their original manner of commixture: for this very extraordinary circumſtance attends them, that though in their primitive ſtate they vitrify eaſily, and act as a ſtrong flux to any of the vitreſcible earths or ſtones; yet, if the ſalts be ſeparated from the earth, by ſolution in water, the earth from that time becomes extremely repugnant to vitrification; and though the ſame ſalts which were taken away from it, or even a much larger quantity be again added to it, it reſiſts their fluxing power, and diſplays a nature intirely different from that which it appeared to have before its ſeparation from the ſalts. There is no preparation neceſſary for theſe aſhes, in order to their entering into the compoſition of glaſs, except the ſifting them to free them from all the fragments of charcoal, or unburnt parts of the vegetables employed in their production: but they ſhould be carefully kept from damp and moiſture; which would make the ſalts deliquiate, and run off from the earth. The goodneſs of theſe aſhes muſt be diſtinguiſhed by their appearing free from impurities, and by their whiteneſs; and their abounding in ſalt is, likewiſe, a proof of their excellence; which may be examined, by making a lixivium of any known ſmall quantity, and judging of its ſtrength by its weight.

Of the materials uſed to make glaſs colourleſs] As the ſubſtances uſed for producing the various colours in glaſs, will more properly come in queſtion, when I treat particularly of that art, I will omit ſpeaking of them here, and only at preſent enquire into the nature of nitre and magneſia, which are two ingredients uſed for rendering the glaſs colourleſs, that is intended to be ſo: and which, indeed, is the kind much the moſt generally uſeful, and what makes the only ſubject of great manufactures.

The general nature of nitre, or ſalt-petre, has been before obſerved in ſpeaking of it as a flux; and it only remains to explain that quality of it, by which it operates in deſtroying the colour in thoſe compoſitions of glaſs, where it is uſed for that purpoſe. This quality is, the power of accending and ſupporting in a combuſtible ſtate all bodies, which contain phlogiſtic and ſulphureous matter, if they be brought in contact with it, in a certain degree of heat; by which means ſuch ſulphureous or phlogiſtic matter is deſtroyed. Or, in other words, it has the ſame combuſtible power with the air in making bodies burn till they be reduced to the ſtate of a calx. In this intention, therefore, ſalt-petre is made an ingredient in thoſe compoſitions for tranſparent colourleſs glaſs, where lead is uſed as a flux: for ſuch glaſs, having, otherwiſe, a ſtrong tinge of yellow from the phlogiſton of the lead, requires, conſequently, the deſtruction of the phlogiſton, at leaſt to a certain degree, in order to its being freed from this tinge. This operation of the nitre on the lead, is moſt obviouſly apparent, if a piece of ſalt-petre be thrown into melted glaſs formed of lead: for a detonation or exploſive effect immediately ſhews itſelf: and continues till the acid contained in the ſalt-petre be conſumed.

The diſtinct knowledge of this principle, clearly points out in what compoſitions of glaſs, nitre is neceſſary; and, in ſome degree, what the proportions may be in which it ſhould be added to each kind: as ſuch proportion muſt be regulated by the quantity of phlogiſton to be deſtroyed. For, as has been before obſerved, conſidered merely as a flux, it is dearer than the pearl-aſhes, without any advantage, but the being ſomewhat more void of colour. This is obvious, as it is not only of double the price, but weaker in its action, unleſs where meeting with phlogiſtic matter in any of the other ingredients, it be deprived, as was above intimated, of its acid ſpirit; and converted, as it then will be, to exactly the ſame kind of fixt alkaline ſalt, with the pearl-aſhes themſelves: but in the proportion of only one-third of its original weight. In glaſs formed of lead, therefore, the uſe of nitre is abſolutely neceſſary; and, in glaſs of ſalts only, where the colour is to be intirely deſtroyed, and great tranſparency is wanted, as in the caſe of looking-glaſs, and ſeveral other kinds of plates, it is alſo requiſite in a leſs proportion. For, though the appearance of any ſlight yellow tinge may be taken away by the uſe of the magneſia; yet that (for the reaſon we ſhall ſee below) is always attended with a proportionable loſs of the tranſparency.

Magneſia is the other ſubſtance employed for rendering glaſs colourleſs. It is a foſſile, that partakes of the nature of iron ores; but does not contain any conſiderable quantity of that metal, and ſometimes only a very little. It is found in almoſt every country amongſt other iron ores: and frequently, alſo, above the beds of lead ore; where, indeed, the beſt ſeems to have been always found; probably from its being leſs replete with iron, than ſuch as is found in the beds of that metal. The hills near Mendip, in Dorſetſhire, have particularly afforded extremely good. It is not of any peculiar ſhape or figure, but ſomewhat ſtriated like antimony in its texture; and of a browniſh black colour like ſoot. The marks of its being good, is the deepneſs of the colour, and the being free from ſpecks of a metalline appearance, or a lighter caſt: and that ſhould be particularly rejected, which has ſpots of a reddiſh brown, or yellowiſh colour, as being ſigns of the preſence of iron.

When fuſed with glaſs of any kind, it readily vitrifies, and tinges the glaſs of a ſtrong reddiſh purple colour, but not clear and bright. In conſequence of this quality, it is uſed for deſtroying any ſlight yellowiſh or greeniſh tinge in glaſs, that is required to be colourleſs, on the following principle. The three primitive colours of yellow, red, and blue, when mixt in due proportion, deſtroy each other; and produce the effect of grey, in the caſe of opake bodies; and of black, in ſuch as are tranſparent. Now the tinge of magneſia in glaſs being purple, which is a compound of blue and red, and being added to the greeniſh or yellowiſh tinge of the glaſs, conſequently deſtroys the appearance of it; eſpecially the greeniſh, as the proportion of red in it is greater than that of the blue: but a proportion of black being produced, the glaſs is obſcured in the ſame degree, though not ſo, as to be perceptible to the eye, without comparing it with ſome other more pellucid. This is a reaſon for uſing the magneſia ſparingly, or rather avoiding it entirely, in thoſe compoſitions of glaſs, where great tranſparency is demanded; and for forming them of ſuch ingredients as are moſt colourleſs, or may be rendered ſo by the uſe of nitre. Magneſia requires to be well calcined in a hot furnace; and then to undergo a thorough levigation: for it ought to be in the ſtate of an impalpable powder, in order to its perfect commixture with the other matter. It was formerly practiſed to quench the magneſia ſeveral times in vinegar, after reiterated calcinations; with a view of freeing it from any iron that might be mixt with it: but this was needleſs; and is now intirely diſuſed. Its application to the colouring glaſs, in which it is very efficacious for many purpoſes, we ſhall ſpeak of in its proper place.

Of the inſtruments and utenſils employed in the compoſition and preparation of glaſs.] The inſtruments and utenſils employed in the compounding and preparing glaſs are of two kinds: as they are ſubſervient to two different purpoſes: the levigation and commixture of the ingredients; and the fuſion or vitrification of them.

The inſtruments ſubſervient to levigation, and the mixture of the ingredients, are horſe or hand-mills, mortars and peſtles, and flat ſtones and mullars.

The horſe, or hand-mills, may be ſuch as are uſed for other purpoſes: but the ſtones ſhould be of a very hard texture, in order that as little as poſſible of the matter of them may be abraded and commixt with the glaſs.

Where large mortars are uſed fot ſuch ingredients as are not employed in a ſufficient quantity, to make it commodious to grind them in mills, they ſhould be of caſt iron, with peſtles of the ſame; and ſhould be carefully kept from ruſt. But for very nice purpoſes, where the quantity of the matter is ſmall, mortars ſhould be had of bottle or green glaſs, or of flint or agate, as alſo a ſtone and mullar of porphyry or agate, for levigating the calces of metals, or other ingredients uſed in colouring glaſs.

Searces or ſieves of fine lawn ſhould likewiſe be provided, for ſifting ſome of the levigated ſubſtances. They ſhould be like thoſe of the apothecaries and druggiſts, with a cover fitted to the upper part; and a box to the under, for preventing that waſte of the matter which attends the ſifting in the open air.

The utenſils employed in the fuſing or vitrifying the matter of glaſs are, furnaces, with the proper iron work; pots for containing the compoſitions when put into the fire; with the iron inſtruments for ſhifting the matter from one to the other, in caſe of accident; and for taking out ſmall portions, to judge of the progreſs of the vitrification, and the qualities of the glaſs.

The ſtructure of the furnaces for preparing and working glaſs in large, is ſo well and commonly known, that it is needleſs to enter into the detail of it here. Where ſmaller quantities are prepared, as in the caſe of coloured glaſs, or paſtes in imitations of ſtones, the common wind-furnace, or the athanor of the chemiſts, may be uſed; or a furnace may be made for this particular purpoſe, which may be conſtructed in the following manner.

Mark out a circular area of one yard diameter; and let a cylindrical building be raiſed upon it of good ſtock bricks, and coal-aſh mortar, of the height of twelve inches. This cylindar muſt have an hollow area in the middle, of a round form, twelve inches in diameter; the reſt of the ſpace being filled with ſolid brickwork. But an opening muſt be left in the front at the bottom, which muſt be ſix inches broad and four high, for taking away the aſhes; and it ſhould likewiſe have an iron frame and door, like thoſe commonly uſed for feeding the fire in furnaces, that it may be occaſionally cloſed, in order to check or extinguiſh the fire. This cylindrical fabric being raiſed to the height of twelve inches, a grate for bearing the fuel, compoſed of a ſtrong iron ring with bars let into it, muſt be laid over the round hollow: and another cylinder, of the ſame diameter and thickneſs of wall, muſt be raiſed in like manner to the height of eight inches above the bars. But this ſhould be done with Windſor bricks, and the mortar formed of Windſor loom, where they can be obtained; and care ſhould be taken, likewiſe, that the brickwork may have good hold of the rim of the grate. At the height of about five inches above the bars, a frame and door ſhould be fixed for feeding the fire. The door ſhould be about five inches high, and eight long; and ſhould have a ſtrong latch going acroſs the whole breadth of it, by which it may be opened and ſhut. When the cylindrical hollow over the bars is thus carried eight inches high, a larger area muſt be taken of twenty-four inches diameter; and the brickwork muſt be carried up round it, in the ſame cylindrical manner as at firſt, for ten inches more; except, that four iron doors and frames of the ſame form with thoſe for feeding the fire muſt be fixt in the brickwork. The dimenſions of theſe doors ſhould be twelve inches high, and eight in breadth; and the loweſt part of them ſhould be level with the flooring made by the brickwork on enlarging the area of the cavity of the furnace: or, in other words, where the brickwork of this wider cylinder begins. Theſe doors ſhould be placed at equal diſtances from each other, and in ſuch manner, that the other for feeding the fire may be exactly in the middle betwixt the two neareſt to the front; and the chimney betwixt the others. A hole ſhould be likewiſe left for venting the ſmoke into the chimney, which may be ſix inches broad and three high: and after this the brickwork may be brought together, in the manner of an arch, till the whole cavity be covered. For the whole of this upper part, Windſor bricks and Windſor loom ſhould be uſed, or, where they cannot be procured, ſuch other as are moſt like them in their quality of bearing intenſe heat, without either being calcined or vitrified. The manner of uſing this furnace is too obvious, to require explanation; it being enough apparent, that the flooring in the enlarged cavity is intended for the pots, or crucibles containing the matter; and the four doors for the more conveniently putting them in, and taking them out. When, however, they are to be placed in the furnace, it ſhould not be on the parts before the doors; for fear the ſtream of cold air, on opening the doors occaſionally, may crack them. But they ſhould be conveyed through one of the doors to the oppoſite ſide, by means of an iron peel, formed like thoſe of the bakers; and put betwixt the doors on that ſide; by which means, they will not only be much ſafer, but will be out of the way of impeding the operator from ſeeing what paſſes in every part of the furnace: and, by this means, likewiſe, room may be found for many more pots and crucibles, than could be introduced if the firſt four ſtood before the doors; and blocked up the entrance againſt any other. When this furnace is wanted for calcinations, or other operations that require leſs heat, the area of the cylinder ſhould be made leſs by bricks formed of Windſor loom and ſand, and adapted to the cylindrical figure of the cavity: which bricks may be eaſily put in, or taken out, by means of the four doors in the upper part, and that in the lower for feeding the fire. The dimenſions of this furnace are calculated to anſwer the purpoſe of thoſe, who may engage in theſe matters for profit; and may be enlarged, if there be yet occaſion: but for ſuch as meddle with them ſpeculatively, and in the view of experiments only, they may be proportionably contracted; as being much larger than needful.

The pots for containing the melted matter of the glaſs ſhould be formed of the clay uſed for making tobacco-pipes, or of the beſt potters clay that can be procured. But as there are ſeldom any ſuch clay found, as will ſtand the drying and burning well, without the admixture of ſome earthy body, broken crucibles ground to powder, or, in default of them, white ſand, or calcined flints duly levigated, may be added. Near London the tobacco-pipe clay, or the Sturbridge clay, with a fourth or fifth of ground crucibles or ſand, are the beſt materials that can be uſed: but care ſhould be taken to free the clay perfectly from ſtones or gravel, and to incorporate the ground crucibles or ſand well with the clay. When the tobacco-pipe clay is uſed, it is previouſly calcined, and then ground to powder; and afterwards moiſtened with water, then well beat in the manner of mortar.

Small pots for making paſtes or coloured glaſſes may be formed on a wooden mould; and ſhould be ſlowly dried, and afterwards baked or burnt, in a fire very gradually increaſed to a ſtrong degree, and then ſuffered to extinguiſh before the pots be taken out of the furnace. This may be done commodiouſly in a potter's kiln, along with earthen or ſtone ware. But the pots ſhould be placed in the hotteſt part of the furnace. They otherwiſe may be burnt, where other conveniencies are wanting, commodiouſly enough in the furnace above-mentioned; and if intended to be uſed in ſuch furnace, the largeſt may be ſix inches diameter, and ten or twelve inches in height. However, they muſt be formed a little conical or narrower at the bottom than the top, that they may be the more eaſily drawn from the mould; which need only to be a piece of wood turned into the form and dimenſions of the cavity of the pot.

Of the ſeveral kinds of white glaſs; and their compoſition in general.] The ſeveral kinds of white tranſparent glaſs now in uſe in this part of the world are, the flint-glaſs (as it is here called) and the German chryſtal-glaſs, which are applied to the ſame uſes and purpoſes;—the glaſs for plates for mirrors or looking-glaſſes;—the glaſs for windows and other lights;—and the glaſs for phials, and ſuch kind of ſmall veſſels.

Of each of theſe kinds there are ſeveral ſorts; ſome only differing in the particular compoſition and management of the directors of the works where they are manufactured, but alike in their price, and the uſes to which they are applied: and others, which are allowedly inferior ſorts, ſold at cheaper rates, and employed accordingly for coarſer purpoſes.

The ſeveral kinds of glaſs differ in the ſubſtances employed as fluxes in forming them, as well as in the coarſeneſs or fineneſs of ſuch as are uſed for their body. The flint and chryſtal, mirror, and beſt window-glaſs, not only require ſuch purity in the fluxes, as may render it practicable to free the glaſs perfectly from all colour; but, for the ſame reaſon alſo, either the white Lynn ſand, calcined flints, or white pebbles, ſhould be uſed. The others do not demand the ſame nicety in the choice of the materials; tho' the ſecond kind of window-glaſs, and the beſt kind of phial, will not be ſo clear as they ought, if either too brown ſand, or impure ſalts, be ſuffered to enter into their compoſition. It is to be greatly regretted, that the important manufacture of glaſs ſhould not be ſo cultivated and encouraged in theſe kingdoms, as to prevent totally the importation of the foreign: whereas, from the production of the ſand, lead, and coals, in our own country, we may make the beſt ſorts of glaſs much cheaper, than can be done elſewhere. We yet, however, take looking-glaſs plates of France, to the amount of a very conſiderable ſum; ſome window-glaſs of the Dutch; and the German drinking-glaſſes for water, with gilt edges and other ornaments, are now coming again extremely into faſhion. The cauſes of this demand for foreign commodities, which are, or might be better, and cheaper manufactured here, are various; and the diſplaying them not being a proper part o my buſineſs at preſent, I ſhall wave it; and only intimate, that the tax laid upon glaſs (againſt all th principles of good policy) has greatly corroborate them; as well as checked a growing exportation o ſome articles, which would probably in time hav been of very great conſequence to our commerce.

Of the nature and compoſition of flint-glaſs; and th German chryſtal glaſs.] Flint-glaſs, as it is called i

ou

our country, is of the ſame general kind with what is in other places called chryſtal-glaſs. It had this name from being originally made with calcined flints, before the uſe of the white ſand was underſtood; and, though no flints are now uſed in its compoſition, it retains ſtill the name. This kind differs, however, from the German and other chryſtal-glaſs, in being partly formed of lead; whereas the fluxing bodies employed for the others are only ſalts or arſenic; and in having a white ſand (which as is ſaid before appears to be fragments of chryſtal) for its body. Inſtead of which, calcined flints, or the white river pebbles, or other ſuch ſtones, are uſed for the chryſtal-glaſs in other places: there being no ſand of this kind of equal goodneſs found out of England, as far as is hitherto known.

The compoſition of flint-glaſs is, therefore principally the white ſand and lead; to which a due proportion of nitre is added, to burn away the phlogiſton of the lead: which otherwiſe imparts a ſtrong yellow tinge to the glaſs; and to this is added, for hiding the remainder of the colour, a ſmall quantity of magneſia: as alſo in ſome works a proportion of arſenic, to aid the fluxing ingredients. Flint-glaſs is not, however, a ſimple glaſs of lead: for where no other ſalts are added, yet the quantity of nitre uſed being conſiderable, and fluxing a proportionable quantity of the ſand, it muſt be conſidered as a compound glaſs of ſalts and lead. But indeed it has been generally practiſed, to add ſome quantity of other ſalts to it; and diminiſh proportionably the quantity of lead otherwiſe neceſſary. This quantity, though great in the glaſs made ſome time ago, ſeems to be much diminiſhed in that manufactured lately; at leaſt in ſome works: as appears from the ſmall weight and tranſparency of what is now to be met with; as well as from the veſſels being blown much thinner, and of leſs ſubſtance, than the glaſs in which lead abounds could well bear to be. The admiſſion of lead into glaſs renders ſuch glaſs leſs hard and tranſparent, than that made of ſalts only.

But

But there is in glaſs of lead a power of reflecting the rays of light, of the ſame nature with that of diamonds and topazes, that gives a luſtre and brilliant appearance to veſſels of a round figure, not found in the mere glaſs of ſalts: where the too great tranſparency, and want of play, occaſion a poorneſs or deadneſs in the look, when ſeen by the other: and this likewiſe extends itſelf in ſome degree to the appearance of liquors contained in them. For polygonal veſſels however, or thoſe cut with flat ſides, or ſuch as are decorated with flowers, or other ornaments cut in them, or with gilding, the glaſs of ſalts is preferable; as may be obſerved in the inſtance of thoſe brought from Germany. This muſt not, nevertheleſs, be extended to ſuch pieces as are cut with a great number of angles for the parts of chandeliers, or other purpoſes where the play of the light is wanted: for in all ſuch caſes, the glaſs formed with lead again takes place of the other; as producing a greatly ſtronger and more beautiful effect, for the reaſons before given.

It appears from what has been ſaid, that flint-glaſs may be, as in fact it is, formed of various compoſitions, by altering the quantities of lead and nitre, and adding equivalent proportions of other ſalts or arſenic: in conſequence of which, ſavings may be made in the expence, and a difference will ariſe in the hardneſs or ſoftneſs of the glaſs. For the more the quantities of nitre or other ſalts are increaſed, and that of the lead diminiſhed, the more hard and firm the texture of the glaſs will be; and ſo vice verſa. I will, therefore, give a recipe for the compoſition of a glaſs, according to each of the ſeveral manners, in which the proportions of the ingredients may be properly varied; and diſtinguiſh, likewiſe, in each caſe, what the abſolute and comparative qualities of the glaſs produced will be; and with reſpect to the comparative expence, the quantities of the ſeveral ingredients being thus ſtated, it will be very eaſy, for thoſe, who are acquainted with the market-price of them, to make a computation.

No. 1. *Compoſition of the moſt perfect kind of flint-glaſs.*] "Take of the white ſand one hundred and "twenty pounds, of red lead fifty pounds, of the "beſt pearl-aſhes forty pounds, of nitre twenty "pounds, and of magneſia five ounces."—If this compoſition be fuſed with a very ſtrong fire, and time be given to it, a glaſs will be produced, that will have the play of the beſt flint-glaſs, and yet be hard and ſtrong. It is not ſo cheap as the compoſitions below given, where arſenic or common ſalt is introduced, or where more of the pearl-aſhes are uſed: in either of which caſes, ſavings may be made, by diminiſhing proportionably the quantities of nitre. But the qualities of this glaſs will be found to come nearer to the ſtandard of perfection: which is to unite the luſtre and hardneſs together in the greateſt degree, they are compatible with each other.

If this compoſition be, however, deſired to flux with leſs heat and quicker, a pound or two of arſenic may be added: which will be found effectually to anſwer the purpoſe.

No. 2. *Compoſition of flint-glaſs with a greater proportion of ſalts.*] "Take of ſand one hundred and "twenty pounds, of the beſt pearl-aſhes fifty-four "pounds, of red lead thirty-ſix pounds, of nitre "twelve pounds, and of magneſia ſix ounces."—This will require much the ſame fire as the other: but will be harder in its texture; and have leſs of the refractive play of the light: it is, however, a very good compoſition of glaſs; and comes nearer to the kind now made: though I imagine the proportion of lead is ſtill more diminiſhed in ſome I have ſeen than here. If it be deſired, to be made more yielding to the fire, arſenic may be added as is directed for the preceding; or the quantity of ſand may be leſſened; but in that caſe the glaſs will be ſofter and weaker.

No. 3. *Cheaper compoſition of flint-glaſs with arſenic.*] "Take of white ſand one hundred and twenty "pounds, of the beſt pearl-aſhes thirty five pounds, "of red lead forty pounds, of nitre thirteen pounds,

" of arſenic ſix pounds, and of magneſia four oun-" ces."—This glaſs will require a conſiderable time in the fire to become clear, and muſt not, if it can be avoided, be ſtrongly urged at firſt: for the arſenic is apt to ſublime away, if the heat be violent before the other ingredients run into fuſion ſo as to detain it. It is well, therefore, to mix a conſiderable proportion of glaſs, which has been wrought before, and is to be manufactured over again with this compoſition when it is uſed; which, running ſooner than the new mixt ingredients, will take hold of the arſenic, and fix it. This compoſition ſhould, however, be afterwards fuſed, with a conſiderable heat; and conttnued in that ſtate till the milky appearance of the arſenic, which it will ſometimes retain for a long time, be intirely gone. For notwithſtanding this apparent reluctance to perfect vitrification, the arſenic never fails at length to become very tranſparent glaſs; and even to contribute greatly to render the other ingredients ſo likewiſe. This glaſs will not be ſo hard as thoſe of the above compoſitions: but it will be very clear, and may be employed for the formation of large veſſels, where a ſufficient thickneſs can be allowed to give them ſtrength.

No. 4. *Cheaper compoſition of glaſs by means of common ſalt.*] " Take the proportions of the other in-" gredients given in the laſt; and, omitting the ar-" ſenic, add in its ſtead fifteen pounds of common " ſalt."—This will be more brittle than the laſt; and therefore cannot be recommended, unleſs for the fabrication of ſuch kind of veſſels, or other pieces, where the ſtrength is of little moment.

No. 5. *Cheapeſt compoſition of flint-glaſs, by the addition of arſenic and common ſalt.*] " Take of the " white ſand one hundred and twenty pounds, of " red lead thirty pounds, of the beſt pearl-aſhes " twenty pounds, of nitre ten pounds, of common " ſalt fifteen pounds, and of arſenic ſix pounds."—This glaſs will fuſe with a moderate heat; but requires time, like the laſt, to take off the milky appearance of the arſenic: it is yet ſofter than the laſt;

and may, therefore, be deemed the worſt kind of flint-glaſs, that can be made, preſerving the appearance of good glaſs to the eye; which it will have equally with any other when properly managed.

No. 6. *Compoſition of the beſt German chryſtal-glaſs.*] "Take of the calcined flints, or white ſand, one "hundred and twenty pounds, of the beſt pearl-"aſhes ſeventy pounds, of ſalt-petre ten pounds, "of arſenic half a pound, and of magneſia five "ounces."—If the pearl-aſhes be pure and good, this glaſs will equal the beſt of this kind that ever was made. Borax has been frequently uſed alſo in the compoſitions for this ſort of glaſs; but its great price, without any equivalent advantage, will deter from the employing it in large manufactures; as there is no ſort of tranſparent glaſs in common practice, that of which looking-glaſs plates is made excepted, can bear the expence of it.

No. 7. *Cheaper compoſition of German chryſtal-glaſs.*] "Take of calcined flints, or white ſand, one hund-"red and twenty pounds, of pearl-aſhes forty-ſix "pounds, of nitre ſeven pounds, of arſenic ſix "pounds, and of magneſia five ounces."—This compoſition requires a long continuance of heat, on account of the arſenic, for the reaſon before given. It produces a glaſs equally, or more, tranſparent, and colourleſs, than the preceding, but ſomewhat more brittle. The arſenic is, however, ſo diſagreeable an ingredient, from the deleterious qualities of the fumes, which will neceſſarily riſe copiouſly till the fuſion of the other ingredients check it, that, where the advantage is not more conſiderable than the ſaving ariſing from the difference of theſe two recipes, it is ſcarcely worth while to ſubmit to the inconveniencies of it.

Of the nature and compoſition of the glaſs proper for plates for mirrors or looking-glaſſes.] The glaſs for forming the looking-glaſs plates in perfection is the moſt nice and difficult kind to manage, of any whatever; there being no latitude, with reſpect to ſeveral of the qualities, as there is in the caſe of flint-glaſs, without its goodneſs being really impaired. Theſe qualities are, to be intirely tranſparent and colourleſs; to have as little power of refracting the rays of light as poſſible; to be intirely free from bubbles, ſpecks and flaws, and to be fuſible with a moderate heat. Hardneſs of conſiſtence is of leſs conſequence in this kind of glaſs than in the flint; though it is an additional excellence; as far as it may be had along with the other qualities: ſince the plates may, in that caſe, be wrought thinner with the ſame degree of ſtrength; which is a conſiderable advantage to mirrors made of them.

The white ſand is the proper ingredient for forming the body of this kind of glaſs, as well as of the flint: and the principal part of the flux ſhould be the fixt alkaline ſalt of vegetables; which the pearl-aſhes will beſt furniſh, when duly purified. This ſalt muſt, however, be aided by borax, or common ſalt; in order to facilitate the fuſion, and prevent the glaſs from ſtiffening in that degree of heat, in which it is to be wrought into plates. Lead is by no means a proper ingredient in the compoſition of this kind of glaſs; on account of its augmenting the refracting power; and for the ſame reaſon arſenic, which has the like effect, though in a much leſs degree, ſhould be either omitted, or but ſparingly uſed. The ſand ſhould be carefully cleanſed, for this uſe, by the means above directed for that purpoſe, p. 129, and the borax ſhould be firſt calcined, and then rubbed to powder. The pearl-aſhes muſt likewiſe be purified for this uſe, which may be done in the following way.

Manner of purifying the pearl aſhes.] "Take any "quantity of the beſt pearl-aſhes, and diſſolve them "in four times their weight of water boiling: "which operation may be beſt performed in a pot "of caſt iron. When they are diſſolved, let the ſolution be put into a clean tub; and ſuffered to remain there twenty-four hours or longer. Let the "clear part of the fluid be then decanted off from "the dregs or ſediment, and put back into the iron

" pot; in which the water muſt be evaporated away " till the ſalts be left perfectly dry again. They " ſhould then, if not uſed immediately, be kept in " ſtone jars well ſecured from moiſture and air, till " ſuch time as they are wanted."—Great care ſhould be always taken, in this treatment of the ſalts, to keep the iron pot thoroughly clean from ruſt, which would give the yellow tinge to the glaſs, not to be removed without greatly injuring it.

No. 1. *Beſt compoſition of glaſs for looking-glaſs plates.*] " Take of white ſand cleanſed ſixty pounds, " of purified pearl-aſhes twenty-five pounds, of ſalt-" petre fifteen pounds, and of borax ſeven pounds." —This compoſition ſhould be continued long in the fire; which ſhould be for ſome time ſtrong, and afterwards more moderate, that the glaſs may be intirely free from bubbles before it be worked. It will be intirely clear of all colour, unleſs in caſe of ſome accident: but if any yellow tinge ſhould, nevertheleſs, unfortunately infect it, there is no remedy, except by adding a ſmall proportion of magneſia, which ſhould be mixed with an equal quantity of arſenic; and after their being put into the glaſs, giving it a conſiderable heat again; and then ſuffering it to free itſelf from bubbles in a more moderate one, as before. If the tinge be ſlight, an ounce of magneſia may be firſt tried; and if that prove inſufficient, the quantity muſt be increaſed; but the glaſs will always be obſcure, in proportion to the quantity that is admitted; though, perhaps, not in a degree, that may prevent it from paſſing currently with thoſe who do not examine with great ſtrictneſs. This compoſition is not to be made without expence, at the times when borax is dear: but the great price which looking-glaſs plates, particularly ſuch as are large, bear, will very well allow it: or even the adding a greater quantity of borax, when there is occaſion to have the glaſs run more eaſily, and roll in a leſs degree of heat.

No. 2. *Cheaper compoſition for looking-glaſs plates.*] " Take of the white ſand ſixty pounds, of pearl-

" aſhes twenty pounds, of common ſalt ten pounds, " of nitre ſeven pounds, of arſenic two pounds, and " of borax one pound."—This glaſs will run with as little heat as the former; but it will be more brittle, and refract the rays of light in a greater degree. It is, therefore, worſe than the other in a greater degree, than is balanced by the ſaving in an article, where the coſt of the materials is not conſiderable in proportion to the return; it being the work and ſkill, and not the prime expence of the ingredients, that make the high price of looking-glaſs plates. It would be, conſequently, unpardonable, while they continue to be ſold at the preſent dear rates they bear in this country, to impair the quality of the glaſs, for the ſake of a trifling ſaving out of the original price of the materials.

Of the nature and compoſition of window-glaſs.] In order to have window-glaſs in the utmoſt perfection, the ſame qualities and treatment are required, as for the looking-glaſs plates; and the ſame kind of glaſs is, therefore, uſed for lights, where the expence can be allowed. But as that is only done in extraordinary caſes, inferior kinds of various rates of price are wanted for more common purpoſes; where not only the coſt of grinding may be ſaved, but even the glaſs itſelf afforded cheaper, on account of its compoſition. The beſt of theſe kinds is called crown-glaſs: the compoſition for which may be as follows; the ingredients being previouſly prepared in the ſame manner as for the looking-glaſs.

No. 1. *Compoſition of crown (or the beſt window) glaſs.*] " Take of white ſand ſixty pounds, of purified pearl-aſhes thirty pounds, of ſalt-petre fifteen pounds, of borax one pound, and of arſenic " half a pound."—This will be very clear and colourleſs, if the ingredients be good: and will not be very dear. It will run with a moderate heat; but if it be deſired to be yet more fuſible and ſoft, half a pound or a pound more of arſenic may be added. If the glaſs ſhould prove yellow, the magneſia muſt be uſed, as above directed for the looking-glaſs.

No. 2. *Compoſition for a cheaper kind of window-glaſs.*] "Take of white ſand ſixty pounds, of unpurified pearl-aſhes twenty-five pounds, of common ſalt ten pounds, of nitre five pounds, of arſenic two pounds, and of magneſia one ounce and a half."—This will be inferior to the above kind; but may be improved, where deſired, by purifying the pearl-aſhes. This operation will not only free them from the remaining part of the earth of the aſhes they were extracted from; (which is apt to give a ſmall degree of opacity to the glaſs, as it will not vitrify in this ſtate;) but renders them alſo leſs liable to impart a yellow tinge to the glaſs; and, therefore, where the goodneſs of ſuch aſhes is known by trial, an ounce of the magneſia, or perhaps more, may be ſpared.

No. 3. *Compoſition of common or green window-glaſs.*] "Take of white ſand ſixty pounds, of unpurified pearl-aſhes thirty pounds, of common ſalt ten pounds, of arſenic two pounds, and of magneſia two ounces."—This is a cheap compoſition; and will not much appear green, nor be very deficient in tranſparency.

No. 4. *Cheapeſt compoſition of common (or green) window-glaſs.*] "Take of the cheapeſt kind of white ſand one hundred and twenty pounds, of unpurified pearl-aſhes thirty pounds, of wood-aſhes well burnt and ſifted ſixty pounds, of common ſalt twenty pounds, and of arſenic five pounds."—This compoſition is very cheap, and will produce a glaſs with a greeniſh caſt; but greatly ſuperior to what I have frequently met with: though nothing that will at all anſwer the end, can be well prepared at leſs expence.

Of the nature and compoſition of the glaſs for phials.] The glaſs of which phials for the uſe of apothecaries, ink-bottles, and many other ſuch ſmall veſſels, are made, is a kind betwixt the flint-glaſs and the common bottle or green glaſs. A very good ſort of which may be thus prepared.

No. 1. *Compoſition of the beſt phial-glaſs.*] " Take " of white ſand one hundred and twenty pounds, " of unpurified pearl-aſhes fifty pounds, of common " ſalt ten pounds, of arſenic five pounds, and of " magneſia five ounces."—This will be a very good glaſs for the purpoſe ; and will work with a moderate heat : but requires time to become clear, on account of the proportion of arſenic : when, however, is is once in good condition, it will come very near to the chryſtal-glaſs.

No. 2. *Cheapeſt compoſition of green or common phial-glaſs.*] " Take of the cheapeſt kind of white ſand " one hundred and twenty pounds, of wood-aſhes " well burnt and ſifted eighty pounds, of pearl-aſhes " twenty pounds, of common ſalt fifteen pounds, " of arſenic one pound."—This will be green, but tolerably tranſparent ; and will work with a moderate fire, and vitrify quickly with a ſtrong one.

Of the commixture of the ingredients for the ſeveral compoſitions of white tranſparent glaſs.] The commixture of the ingredients for making glaſs muſt be performed by different methods, according to the nature of the ingredients that enter into the different compoſitions.

When ſand, and fixt alkaline ſalts, whether in form of pearl-aſhes, or of ſuch as are extracted from them, or any other aſhes of vegetables, are uſed together, they ought to be thoroughly mixt, by grinding them in a place free from damp. When they are ſo mixt, they ſhould be put into a proper calcining furnace ; and there continued in a moderate heat for five or ſix hours ; being in the mean time frequently turned over and ſtirred about, by means of a proper rake ; and at the end of that time taken out of the furnace, and either immediately uſed, or kept, where no moiſture can have acceſs to them, till wanted. The matter in this ſtate is called frit, and may be converted into glaſs without further preparation, than being broken into groſs powder before it be put into the pots ; unleſs where other ingredients are to be added to it: in which caſe the following methods may be purſued.

When nitre is to be added to the frit, it ſhould be after the calcination: and if it be well powdered, it may be mixed with the frit, without their being ground together.

If arſenic be alſo uſed, it ſhould, being previouſly well levigated, be mixed with the nitre, at the time that it is to be powdered; and they may be then added together to the frit. But if no nitre be uſed, it ſhould be ground with ſome pounds of the frit; or rather with ſome of the ſalts of which the frit is made; and then put to it.

In the caſe of the flint-glaſs, when large proportions of lead and nitre are admitted into the compoſition; or in other caſes of ſoft glaſs, where very powerful fluxes are uſed; the calcining the frit is diſpenſed with, and the ſand, alkaline ſalts, lead, nitre, and alſo arſenic, if any be uſed, are thoroughly mixt together by grinding. But if a calcined frit be uſed, the matter, after it has undergone that operation, and been groſsly powdered, muſt be put into the pot with the other ingredients in that ſtate; they being previouſly well commixt together by grinding.

If borax be uſed with the frit alone, it ſhould be ground with a ſmall part of it; and then mixt with the reſt. But, if other ingredients are to be added, it may be ground with them. It ſhould, however, be always firſt calcined, that is, placed in a moderate heat, till the ebullition it makes at firſt be over, and it be left in a dry ſtate.

When common ſalt is uſed in the compoſition of glaſs where the frit is prepared, it may be added to the alkaline ſalt and ſand when they are to be ground together; and calcined along with them, which will ſpare the trouble of the decrepitation, mentioned p. 129 to be neceſſary. The ſalt muſt otherwiſe be put into a proper veſſel, and continued in a gentle heat till it ceaſes the crackling it will for ſome time make: and, if it be not uſed immediately, it muſt be carefully

fully kept from all moiſture, even that of the air. When no frit is previouſly made, ſo as to afford an opportunity of calcining the ſalt with it, being firſt decrepitated, it may be mixt with any of the other ingredients; but muſt not be ſuffered to attract any moiſture; otherwiſe it will crackle and decrepitate again in the pots, and waſte the matter, by diſſipating it with the numberleſs little exploſions it will make.

Magneſia, when admitted into the compoſition of glaſs made of frit without any other addition, being well levigated preparatorily, ſhould be intimately mixt by grinding with ſome pounds of the frit; and then put into the pots along with the reſt. But where lead, ſalt-petre, or other ingredients, are to be added, it may be mixt with them when they are ground; and then put to the frit. If no frit be prepared, it may, nevertheleſs, be mingled with any of the fluxing ingredients, and ſo commixt with the whole maſs.

Of the manner of melting and fuſing the ſeveral compoſitions, in order to their converſion into glaſs: with the means of judging when the vitrification is perfect.] The materials being all prepared and duly mixt, the matter muſt be put into the pots: and urged to fuſion, by a heat proportioned to the ſtrength of the flux in the compoſition: and this muſt be continued till the whole maſs become one uniform fluid; and have acquired the qualities neceſſary in that particular kind of glaſs which is intended to be produced. There is an attention to another object, however, required in the mean time; which is, the taking off the ſcum and foulneſs that will ariſe on the glaſs in the action of the ingredients on each other, and the coction of the matter. This is to be done by means of proper ladles; and ſhould be effectually performed before the glaſs be wrought: otherwiſe it will be ſo fouled by this ſubſtance, as to be rendered of very little value. This matter is called ſandover: and is ſold to the colourmen, who diſpoſe of it to the potters; and they uſe it in the compoſitions of their glazings.

The exact time for keeping the ſeveral compoſitions of glaſs in fuſion, in order to their perfect vitrification, can by no means be ſettled by rule. For there is ſo much variation in the diſpoſition of different parcels of materials of the ſame kind to vitrify; and likewiſe ſo great an uncertainty, with reſpect to the degrees of heat maintainable even in the ſame furnace, that it muſt be left to the judgment of the operator. But where the power of the flux is weaker, as may be gathered from the nature and proportions of the ingredients in the compoſition, or where the heat is leſs intenſe, a greater time will neceſſarily be required, than in the caſe of ſtronger fluxes, and briſker fires. No damage can, however, accrue from allowing a longer fuſion than may be neceſſary to give the glaſs the appearance of being perfect, except the loſs of time and conſumption of fewel: for with reſpect to the white tranſparent glaſs, it is always improved in its hardneſs, and clearneſs, by a longer coction.

In order to examine, whether the glaſs have attained to its due ſtate of vitrification, an iron rod, of which the end ſhould be bright, or at leaſt intirely free from ruſt, muſt be dipt in the melted matter: and what adheres to it ſhould be firſt tried, with reſpect to its ductility or readineſs to ſuffer itſelf to be drawn out in long threads; and, if this quality be found in it to a ſufficient degree, being ſuffered to cool, it ſhould be carefully inſpected, to form a judgment of its colour and clearneſs. If it be tranſparent, colourleſs, and free from all ſpecks and bubbles, it may be concluded perfect, and fit to be wrought. But if it want theſe marks, more time muſt be given, according to the degree of the defectiveneſs; and, after a reaſonable allowance of ſuch time, it muſt be examined again by the ſame means: and, if not yet perfect, a further time muſt be given, and then the ſame trial made again. If, nevertheleſs, after all reaſonable allowance of time, and the application of a ſtrong heat, which ſhould be raiſed as high as can be admitted conveniently, without detriment to the other operations that may be carrying on in the ſame furnace, the glaſs yet appear faulty, the means, below adviſed, muſt be called in aid; in order to remedy the defects, either in the materials themſelves, or the means of their compoſition.

Of the means of promoting and accelerating the perfect vitrification of the ingredients, when the compoſition proves defective in that point: with the means of removing any yellowiſh or greeniſh tinge that may ariſe.] If, after the treatment above adviſed, ſufficient time and heat having been given, according to the nature of the compoſition, the glaſs will not be brought to run into one equal fluid maſs, but appear yet turbid and milky, or to abound in bubbles after ſome abatement of the fire, it muſt be concluded, that the flux is too weak. An additional quantity of the fluxing ingredients, mixt together in the ſame relative proportion as at firſt, muſt be therefore put into the pot to the melted maſs; but gradually, leſt any ſudden ebullition may ſwell the matter, and force part of it out of the pot. The proportion of the whole of this additional quantity, muſt be regulated by the appearance of what may be wanted from the backwardneſs of the vitrification in the glaſs. But it is better to try a ſmaller quantity firſt; becauſe more may eaſily be added, if found neceſſary; and an exceſs, on the other hand, injures the qualities of the glaſs; and in the caſe of ſalts cannot be rectified, unleſs by a long continuance of the fuſion. There is, moreover, this further reaſon for trying only a ſmaller quantity at firſt; that frequently much leſs will anſwer the end, than the appearance may ſeem to make neceſſary.

It is the practice of ſome, when the vitrification will not go forwards, to have recourſe to the following expedient. They take four, or perhaps ſix ounces of arſenic, and mix with it an ounce of magneſia: and, wrapping them tightly in a piece of paper of ſeveral doubles, they faſten the maſs to the end of their iron; and plunge it down to the bottom of the pot; where, the ſubſtance of the paper being deſtroyed, the matter is left. This will frequently ſucceed; and the glaſs will grow clear firſt, towards the bottom, and ſoon after quite to the top; and gain the perfect ſtate of vitrification. The magneſia, nevertheleſs, however it may promote the fuſing power of the arſenic, does not ſeem a very proper ingredient in all caſes. For where there is no yellow tinge in the glaſs, it will neceſſarily impart a purpliſh caſt; which, though perhaps in too ſlight a degree to be eaſily diſtinguiſhed on a common inſpection, is nevertheleſs an imperfection; and would ſhew itſelf, if the glaſs were to be compared with ſuch as was abſolutely colourleſs. I ſhould think it, therefore, better to join two or three ounces of calcined borax with the arſenic, which would anſwer the end without any kind of injury to the glaſs, and would not greatly enhance the expence: when it is premiſed, how conſiderable a return a pot of glaſs makes when worked off.

When the glaſs appears perfect in other reſpects, but is found to have a green or yellow tinge, ſuch tinge may frequently be diminiſhed by the addition of one or two pounds of nitre; if none, or but a ſmall proportion, have before been admitted into the compoſition. The nitre, in this caſe, ſhould be fluxed with ſome frit, or with ſome other glaſs of the ſame kind with that in the pot, before it be put to the other ingredients. This is requiſite, in order that it may the readier mix with the matter; and not be partly blown out of the pot, by the ebullition it would make, in conſequence of the water contained in its chryſtals, or partly ſwim on the ſurface; as would happen, if it were put in crude, without being preparatorily heated or mixed with any other body. But if this fail, or remedy only in part the fault, recourſe muſt be had to the magneſia; to which may be advantageouſly added two or three ounces of arſenic; and they may be conveyed into the pot by the means above directed; which prevents the powders from floating on the ſurface of the melted matter,

ter, where the arſenic would ſoon ſublime away, and take no effect.

Of the compoſition and treatment of the common bottle, or green-glaſs] This kind, excepting the beauty of colour and tranſparency, is the moſt perfect glaſs at preſent manufactured; and, with reſpect to its utility, is alſo equal in importance to any other. It is formed of ſand of any kind, fluxed by the aſhes of burnt wood, or of any parts of vegetables. The aſhes muſt not have the ſalts extracted from them, but muſt conſiſt of them, and the calcined earth of the vegetable ſubſtances, whence they are produced. This earth, though when once ſeparated from the ſalts formed along with it in the incineration, it becomes abſolutely refractory to vitrification; and reſiſts not only the ſame ſalts which were taken from it, but even the ſtrongeſt fluxes; yet conjoined with theſe ſalts, in the manner in which it is originally produced in the incineration, it not only vitrifies perfectly itſelf, but even acts as a flux on ſand. For on the mixing ſand with the entire aſhes, a much greater proportion will be converted into glaſs, than would be by the proportion of ſalts contained in the aſhes, if uſed alone without the earth. In general, the bottle glaſs is only compounded of theſe two ingredients, ſand and wood-aſhes: but where the ſcoria or clinkers of furnaces or forges can be obtained in ſufficient quantity, they may be added with great advantage: as a much leſs proportion of wood-aſhes will become neceſſary, and the good qualities of the glaſs be rather improved than impaired. The ſcoria to be obtained at large foundaries are very proper for the purpoſe: or thoſe from any other ſuch works, where large and ſtrong fires are uſed. The particular compoſition of this glaſs may be as follows; but the proportions here given ſuppoſe the ſofteſt ſand: to procure which care ſhould be taken; as a great ſaving is thence made in the quantity of wood-aſhes neceſſary.

Compoſition of green or bottle-glaſs.] "Take of "wood-aſhes two hundred pounds, and of ſand one

" hundred pounds. Mix them thoroughly well by " grinding together."—This is the due proportion where the ſand is good, and the wood-aſhes are uſed without any other addition: but there are inſtances of ſand of ſo kindly a nature for vitrification, that a greater proportion of it may be added.

Compoſition of green or bottle-glaſs, with the addition of ſcoria or clinkers.] " Take of wood-aſhes one " hundred and ſeventy pounds, of ſand one hundred " pounds, and of ſcoria or clinkers fifty pounds. " Mix the whole well by grinding them together." —The clinkers ſhould be well ground before they be uſed, if they admit of it. But frequently they are too hard; and in that caſe they ſhould be broken into as ſmall bits as can be done conveniently; and mixt with the other matter without any grinding. The harder they are, the leſs material will be the powdering them, as they will the ſooner melt of themſelves in the furnace; and, conſequently, mix with the other ingredients.

The general manner of fuſing, and converting this compoſition to glaſs, is the ſame as in the other kinds: as are alſo the means of judging when the vitrification is perfect; and the remedy of the defect when the firſt compoſition will not produce it; except with reſpect to colour, which is, in the caſe of this kind of glaſs, intirely out of queſtion. When clinkers are not to be had in ſufficient quantity, to allow of their being uſed in the general compoſition, it is well however to have ſome quantity, to employ occaſionally, when the vitrification fails. For the adding ſuch a proportion of them as may appear neceſſary, with an equal part of wood-aſhes, will anſwer the purpoſe much better, than the addition of more wood-aſhes alone, where the flux is found too weak; as will happen ſometimes from the great variation in the different parcels, as well of the aſhes as ſand.

Of the general nature of coloured glaſs: and of the ſeveral compoſitions proper for receiving the colours, in order to the forming glaſs, or paſtes, in imitation of precious *ſtones; with the qualities attendant on each.*] The glaſs, which is intentionally tinged with colours, may be divided into three kinds: the white opake and ſemi-tranſparent glaſs: the tranſparent coloured glaſs: and the ſemi-tranſparent or opake coloured glaſs.

The white opake glaſs, as alſo ſome tranſparent kinds, are principally uſed for making ſmall vaſes, toys, and ſome ſorts of uſeful veſſels, as cream pots, &c. in imitation of China-ware of any kind, of which we ſhall ſpeak below. It is alſo frequently employed, as a white enamel for grounds, by painters of enamel dial-plates, ſnuff-boxes, and other ſuch pieces, as have not occaſion to paſs ſeveral times through the fire, in order to their being finiſhed.

The compoſition of white opake and ſemi-tranſparent glaſs is very various; as any kind of colourleſs glaſs may be made the body of ſuch; and the tinge may be given by calcined tin or antimony; alſo by arſenic, calcined hartſhorn or bones, and ſeveral other ſubſtances.

The tranſparent glaſs, tinged with colours, is likewiſe of different kinds, as the body or ground may be tranſparent colourleſs glaſs of any of the compoſitions above exhibited. But it is commonly diſtinguiſhed into two ſorts only; the one called coloured glaſs; and the other paſtes. The reaſon of which diſtinction lies in this. The chief deſign of all coloured tranſparent glaſs being the imitation of precious ſtones, the qualities of ſuch glaſs, when perfect, are, to be very clear and tranſparent; to be free from all colour but the proper tinge; and to be very hard and tenacious in their texture. But theſe qualities being not to be had, except in glaſs that is very difficult to be melted, and requires a long as well as an intenſe heat, both to its own mature vitrification, and that of the bodies added to give the colour to it; it became inconvenient to thoſe who prepared theſe kind of compoſitions in ſmall quantities, to maintain ſuch ſtrong fires; and therefore ſofter compoſitions were ſought for, that would run with the heat of common ſmall furnaces; and would likewiſe be brought to perfection in a much ſhorter time. Theſe compoſitions were therefore called paſtes, to diſtinguiſh them from the harder glaſs, which retained its proper appellation.

The glaſs moſt proper for the imitation of precious ſtones, where the hardneſs, which is a moſt valuable quality in ſuch as is intended for mock jewels, that are expoſed to much wear, is wanted, is a perfect glaſs of ſalts; in which no more flux is admitted, than merely what may be neceſſary for the complete vitrification of the glaſs, and tinging ſubſtances; but it ſhould be abſolutely free from every kind of tinge, except that which is intended to be given it.

The kind moſt proper for forming paſtes, is a mixt glaſs of lead and ſalts, which will run eaſily; and vitrify in a ſhort time the metalline or other bodies that are employed for tinging it. But in order to make it yet more fuſible, without having ſo large a proportion of lead as may make the texture of the glaſs too tender and brittle, arſenic and borax may be admitted into the compoſition. Beſides the forming imitations of coloured ſtones, there is yet another purpoſe to which this kind of glaſs is peculiarly adapted, which is the making mock diamonds and topazes, that cannot be ſo well counterfeited by any other compoſition; as the lead, according to what was before obſerved, gives a very extraordinary refracting power to the glaſs, of which it is an ingredient. This ſort might ſeem to belong to the claſs of the white tranſparent kinds of glaſs before treated of: but as the application of that kind of compoſition, which renders it properly a paſte according to the above diſtinction, is confined to the intentions of imitating gems, it is more properly introduced amongſt the others, with which it has a common denomination.

The ſemi-tranſparent coloured glaſs may have for its body, either the compoſitions of the harder kinds; or thoſe of paſtes: and it is principally applied to the imitation of the ſemi-tranſparent ſtones, as lapis lazuli, chalcedony, jaſper, agate, opal, or ſuch others. The manner of compoſing them is much the ſame, as that of the tranſparent kinds; except the adding ſome opake white body, which will endure the fuſion of the glaſs, without being vitrified, at leaſt long enough to ſuffer it to be worked into the proper form. But the management of thoſe of this kind, which are compounded of a variety of colours, is much more difficult than that of the tranſparent ſorts: which is moſt probably the reaſon, why they are ſo little in uſe; though ſome of them have a very beautiful effect for purpoſes they might be equally well applied to with the genuine ſtones.

Of the nature and preparation of the ſubſtances uſed for tinging glaſs.] The ſubſtances employed for tinging glaſs, are, for the moſt part, metallic, and other foſſile bodies; or indeed all are ſo, except tartar, which has been added to ſome compoſitions. The metals themſelves make the principal part; and, properly treated, will produce all the colours, except a perfect blue. But for cheapneſs and expedience, the ſemi metals, and preparations from other foſſile bodies, are ſometimes admitted in the place of them; particularly with reſpect to yellow, where antimony ſupplies the place of ſilver.

The ſubſtances that have been uſed for producing any opake whiteneſs, in glaſs, are, calcined tin, (commonly called putty,) calcined antimony, arſenic, calcined horns or bones, and ſometimes common ſalt. The ſubſtances employed for red, are, gold, iron, copper, magneſia, and antimony. The ſubſtances employed for blue, are, zaffer, and copper. The ſubſtances that have been employed for yellow, are, ſilver, iron, antimony, and magneſia with tartar. The ſubſtances employed for greens, are, copper, Bohemian granate, and thoſe which will produce yellow or blue. The ſubſtances employed for purple, are, all ſuch as will produce red and blue. The ſubſtances employed for orange colour, are, antimony, and all thoſe which will produce red and yellow. The ſubſtances employed for black, are, zaffer, magneſia, copper and iron, in various combinations. The Bohemian granate requires no other preparation, than to be well pulverized.

Compoſition of hard glaſs, and paſtes, proper for receiving colours.] Though almoſt every kind of tranſparent colourleſs glaſs will admit of being tinged; yet there are, as was obſerved before, ſome compoſitions, that are more peculiarly adapted to the purpoſes for which the coloured glaſs is intended, either by their hardneſs and tenacious texture; or their being more eaſy to be wrought by thoſe who manufacture them, from their requiring leſs heat to fuſe them, and fluxing the colorific matter expeditiouſly. The clearneſs and tranſparency of the glaſs, and the being devoid of any colour but that intended to be given, are likewiſe neceſſary in both the hard glaſs and paſtes which are to be coloured: and therefore to have them in perfection, a glaſs of each kind ſhould be purpoſely prepared; in which more exact methods may be uſed for producing theſe qualities, than are expediently compatible with the diſpatch and profit of groſſer manufactures. The beſt compoſitions for the hard glaſs are as follow: but as the extreme purity of the fixt alkaline ſalts is of very great conſequence in this caſe, it may not be improper to give previouſly the method of producing it.

Method of bringing pearl-aſhes, or any other fixt alkaline ſalts of vegetables, to the higheſt degree of purity, proper for the moſt tranſparent glaſs.] “ Take of the “ beſt pearl-aſhes three pounds, and of ſalt-petre ſix “ ounces. Pound them together in a glaſs or mar- “ ble mortar, till they are thoroughly well mixt; “ and then put part of them into a large crucible, “ and ſet it in a furnace, where it may undergo a “ ſtrong heat. When the part of the matter, that “ was firſt put into the crucible, is heated red hot, “ throw in the reſt gradually: and if the crucible “ will not contain the whole, pour part of the melt- “ ed matter out on a moiſtened ſtone, or marble; “ and, having made room in the crucible, put in

" the reſt; and let it continue there, likewiſe, till
" it be red hot. Pour it out then as the other; and
" afterwards put the whole into an earthen, or very
" clean iron pot, with ten pints of water; and heat
" it over the fire, till the ſalts be intirely melted.
" Let it then, being taken off the fire, ſtand till it
" be cold; and afterwards filter it through paper,
" in a pewter cullender. When it is filtered, return
" the fluid again into the pot, and evaporate the
" ſalt to dryneſs, which will then be as white as
" ſnow; the nitre having burnt all the phlogiſtic
" matter, that remained in the pearl-aſhes after their
" former calcination.

No. 1. *Compoſition of the beſt and hardeſt glaſs for receiving colours.*] " Take of the beſt ſand, cleanſed by waſhing as directed in p. 129, twelve pounds, " of pearl-aſhes, or fixt alkaline ſalt purified with " nitre as above, ſeven pounds, of ſalt-petre one " pound, and of borax half a pound.—The ſand being firſt reduced to powder in a glaſs or flint mortar, the other ingredients ſhould be put to it, and the whole well mixt, by pounding them together.

No. 2. *Compoſition of the beſt glaſs for receiving colours; but ſomewhat leſs hard than the above.*] " Take " of white ſand cleanſed twelve pounds, of pearl-" aſhes purified with ſalt-petre ſeven pounds, of " nitre one pound, of borax half a pound, and of " arſenic four ounces."—Proceed as in the laſt; but if the glaſs be deſired to melt with yet leſs heat, a pound of borax may be uſed inſtead of the half pound, and a pound of common ſalt may be added; but this laſt is apt to make the glaſs more brittle; which is an injury done to ſuch as is to be cut into very ſmall pieces, and ground with ſo many angles in the figure, as in the imitations of jewels,

No. 3. *Compoſition of ſoft glaſs, or paſte, proper for receiving colours.*] " Take of white ſand cleanſed ſix " pounds, of red-lead three pounds, of purified " pearl-aſhes two pounds, and of nitre one pound." —Proceed in the mixture as with the foregoing.

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No. 4. *Compoſition of glaſs, or paſte, much ſofter than the above.*] "Take of white ſand cleanſed ſix "pounds, of red-lead and purified pearl-aſhes, each "three pounds, of nitre one pound, of borax half "a pound, and of arſenic three ounces."—To be mixt as all the preceding. This is very ſoft, and will fuſe with a very gentle heat; but requires ſome time to become clear, on account of the arſenic. It may even be prepared and tinged in a common fire without a furnace; if the pots containing it can be ſurrounded by burning coals, without danger of their falling into it. The borax, being a more expenſive ingredient than the others, may be omitted, where a ſomewhat greater heat can be applied; and the glaſs is not intended for very nice purpoſes. Or a pound of common ſalt may be ſubſtituted in its place. But the glaſs will be more clear and perfect; and free itſelf much ſooner from bubbles, where the borax is uſed. This glaſs will be very ſoft; and will not bear much wear, if employed for rings, buckles, or ſuch imitations of ſtones, as are expoſed to much rubbing. But for ear-rings, ornaments worn on the breaſt, or ſuch others as are but ſeldom put on, it may laſt a conſiderable time. In all theſe ſoft compoſitions, care ſhould be taken, that part of the ſand be not left unvitrified in the bottom of the pot; as will ſometimes happen. For, in that caſe, the glaſs, abounding too much with ſalts and lead, will not bear the air; but being corroded by it, will ſoon contract a miſtineſs, and ſpecks on the ſurface; which will entirely efface all the luſtre of the paſte. An unlucky inſtance of this particularly happened a few years ago, to the great loſs, and almoſt ruin, of many of the poorer lapidaries. For there being at that time a great demand, for all kinds of ornaments decorated with falſe ſtones for the Spaniſh Weſt-Indian trade, a perſon undertook to make them and furniſh the lapidaries; who, glad of an opportunity of obtaining, on moderate terms, what they had found it difficult to procure before, (as the coloured glaſs had for the moſt part been imported from Venice,) pur-

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chaſed as large quantities as they poſſibly could find money to pay for. But in a ſhort time, both the unwrought paſte, and that which they had been at the labour and expence of cutting, all turned foul, with a dull ſcum on the ſurface, and little ſpecks, which eat down into the ſubſtance; and took away the ſmoothneſs, as well as the luſtre. It is proper, therefore, for thoſe, who prepare ſuch compoſitions, to be careful of adding more ſalts and lead than the proportions here given; and to watch that the ſand, or other matter employed for the body of the compoſition, be really fluxt. And it is equally proper, that they who purchaſe ſuch paſte, ſhould have ſome good ground of aſſurance of its being duly prepared; otherwiſe, they may throw away their money in the purchaſe, their time in cutting, and their credit in diſpoſing, of ſuch a faulty commodity. There is a very certain and good method of preventing the inconvenience ariſing from the ſeparation of the ſalts in the preparation, as well of the hard kind of coloured glaſs, as the paſtes; which is, by previouſly calcining the ſand, and fixt alkaline ſalts, as in the manner of making the frit. This may be done, by putting the ſand and ſalt, reduced to powder, and mixt together, on a tile placed in a furnace of moderate heat; and turning over and ſtirring the matter with a tobacco-pipe, or ſmall iron rod; for which purpoſe, the tile ſhould be either placed near ſome proper opening into the furnace, or drawn to the door at due intervals. When the matter appears to coaleſce ſtrongly, and form a hard body on cooling, it may be taken out; and being kept intirely free from moiſture, ſhould be powdered. It ſhould be then added to the other materials according to the proportion that would have been obſerved, with regard to the ingredients of the frit, if they had been uſed without being combined previouſly, by means of this operation.

Compoſitions of glaſs, or paſte, of a red colour.

No. 1. *Compoſition of a fine red glaſs reſembling the ruby.*] "Take of the hard glaſs, No. 1. or No. 2. " one pound, of the calx caſſii, or gold prepared by

" precipitatio

" precipitation with tin, three drachms. Powder " the glaſs; and grind the calx of gold afterwards " with it in a glaſs, flint, or agate mortar; and " then fuſe them together."—This may be made of a ſtronger or more diluted colour, by varying the proportion of the gold: in adjuſting which properly, regard ſhould be had to the application of the glaſs, when made. For where this glaſs is ſet in rings, bracelets, or other cloſe work, where foils can be uſed, a great ſaving may be made, with regard to the colour of it, without much injury to the effect. But for ear-rings, or other purpoſes, where the work is ſet tranſparent, a full ſtrong colour ſhould be given: which may be effected by the proportions directed in this compoſition.

No. 2. *Compoſition of a paſte reſembling the ruby.*] " Take of the paſte, No. 3. or No. 4. one pound, " of calx caſſii, or precipitation of gold by tin, two " drachms. Proceed in the mixture as with the " above."—This will be equally beautiful with the above; and defective only in ſoftneſs. But as that greatly takes away the value for ſome purpoſes, ſuch as is appropriated to them may be tinged in a cheaper manner by the following means.

No. 3. *Compoſition of a cheaper paſte reſembling the ruby.*] " Take of the compoſition for paſte, No. 3. " or No. 4. half a pound, of glaſs of antimony half " a pound, and of the precipitation of gold by tin " one drachm and a half. Proceed as with the " others."—This will be conſiderably cheaper; and will have much the ſame effect, except that it recedes more from the crimſon to the orange.

No. 4. *Compoſition for hard glaſs reſembling the garnet.*] " Take of the compoſitions for hard glaſs, " No. 1. or No. 2. two pounds, of glaſs of antimony one pound, of magneſia, and of the precipi" tate of gold by tin, each one drachm."—This compoſition is very beautiful, but too expenſive, on account of the gold, for the imitation of garnets for common purpoſes, on which account the following may be ſubſtituted.

No. 5. *Cheaper compoſition of hard glaſs reſembling the garnet.*] "Take of the compoſitions, No. 1. "or No. 2. two pounds, of the glaſs of antimony "two pounds, and of magneſia, two drachms."—If the colour be found too dark and purple in either this or the preceding compoſition, the proportion of magneſia muſt be diminiſhed.

No. 6. *Compoſition of paſte of the colour of garnet.*] "Take of the compoſitions for paſtes, No. 1. or "No. 2. and proceed as with the above."

No. 7. *Compoſition of hard glaſs reſembling the vinegar garnet.*] "Take of the compoſitions, No. 1. "or No. 2. two pounds, of glaſs of antimony one "pound, of iron highly calcined half an ounce. "Mix the iron with the uncoloured glaſs; and fuſe "them together, till the maſs be perfectly tranſparent; then add the glaſs of antimony powdered, "ſtirring the mixture with the end of a tobacco-pipe; and continue them in the heat, till the "whole be perfectly incorporated."

No. 8. *Compoſition of paſte reſembling the vinegar garnet.*] "Take of the compoſition for paſte, No. "3. or No. 4. and proceed as with the foregoing."—In this, as well as in all the ſucceeding compoſitions, it ſhould be obſerved, that ſome allowance may be made in the proportion of the colorific, or tinging matter, for the greater variety of the paſtes than the hard glaſs, on the ſcore of the lead which enters into the compoſition. For, as the volume, in a pound weight of the paſte, is, conſequently, leſs; a leſs quantity of tinging matter is proportionably neceſſary to give the ſame force of colour to it.

Compoſitions of glaſs, and paſte, of a blue colour.

No. 1. *Compoſition of hard glaſs of a very full blue colour.*] "Take of the compoſition for hard glaſs, "No. 1. or No. 2. ten pounds, of zaffer ſix drachms, "and of magneſia two drachms. Proceed as with "the above."—If this glaſs be of too deep a colour, the proportions of the zaffer and magneſia to the glaſs may be diminiſhed: and if it verge too much on the purple, to which caſt it will incline, the magneſia ſhould be omitted. If a very cool or pure blue be wanted, inſtead of the magneſia, half an ounce of calcined copper may be uſed; and the proportion of zaffer diminiſhed by one half.

No. 2. *Compoſition of paſte of a full blue colour.*] "Take of the compoſition for paſte, No. 1. or "No. 2. ten pounds, and proceed as with the fore- "going."

No. 3. *Compoſition of hard glaſs reſembling the ſapphire.*] "Take of the compoſitions for hard glaſs, "No. 1. or No. 2. ten pounds, of zaffer three "drachms and one ſcruple, of the calx caſſii, or "precipitation of gold by tin, one drachm. Pro- "ceed as with the above."

No. 4. *Cheaper compoſition of hard glaſs reſembling the ſapphire.*] "As the foregoing; only, inſtead of "the precipitate of gold, uſe two drachms and two "two ſcruples of magneſia."—If this be well managed, the colour will be very good; and the glaſs, when ſet and cut, will not be eaſily diſtinguiſhable from the true ſapphire: but the preceding will be a finer colour, as there is a foulneſs in the tinge of the magneſia, which will always diminiſh, in ſome degree, the effect of brighter colours, when mixt with them.

No. 5. *Compoſition of paſte reſembling the ſapphire.*] "Take of the compoſition for paſte, No. 3. or No. "4. and proceed as with the foregoing."—It is not worth while to beſtow the expence of colouring paſtes with the gold; and it is, therefore, more expedient, in the caſe of ſuch, to uſe the other method.

No. 6. *Compoſition of hard glaſs, and paſtes, reſembling ſapphires, by means of ſmalt.*] "Take of the "compoſitions for hard glaſs and paſtes, any quan- "tity; and mix with them one eighth of their "weight of ſmalt, the brighteſt and moſt inclining "to purple, that can be procured."—If it be deſired to give a more purple tinge, magneſia may be added in theproportion required.

No. 7. *Compoſition of hard glaſs reſembling the eagle marine (vulgarly called egg-marine.*] "Take of the

" compoſition for hard glaſs, No. 1. or No. 2. ten " pounds, of copper highly calcined with ſulphur " three ounces, and of zaffer one ſcruple. Proceed " as with the foregoing."

No. 8. *Compoſition of paſte reſembling the eagle marine.*] " Take of the compoſition for paſte, No. 1. " or No. 2. ten pounds; and proceed as with the " the above."

Compoſitions of hard glaſs, and paſtes, of a yellow colour.

No. 1. *Compoſition of hard glaſs of gold, or full yellow colour.*] " Take of the compoſitions for hard " glaſs, No. 1. or No. 2. ten pounds, but omit the " ſalt-petre; and for every pound add an ounce of " calcined borax, or, if that do not render the glaſs " ſufficiently fuſible, two ounces, of red tartar, the " deepeſt coloured that can be procured, ten ounces; of magneſia two ounces; of charcoal of ſallow, or any other ſoft kind, two drachms. Proceed as with the reſt."—This colour may be prepared with ſilver: but as there is no advantage in that to counterbalance the expence, I wave giving the proceſs.

N. 2 *Compoſition of paſte of a gold or full yellow colour.*] " Take of the compoſition for paſte, No. 3. " or No. 4. prepared without the ſalt-petre, ten " pounds; of iron ſtrongly calcined, one ounce and " a half. Proceed as with the others."—The crude tartar and the charcoal muſt not be uſed, where lead enters into the compoſition of the glaſs; and the nitre may be ſpared; becauſe the yellow tinge given to the glaſs by the lead, on account of which the nitre is uſed, is no detriment in this caſe; but only adds to the proper colour. This colour may alſo be prepared by crude antimony, as well as the calcined iron: but it is more difficult to be managed, and not ſuperior in its effect.

No. 3. *Compoſition of hard glaſs reſembling the topaz.*] " Take of the compoſition for hard glaſs, No. 1. or " No. 2. ten pounds, and an equal quantity of the " gold coloured hard glaſs. Powder; and fuſe them " together."—As there is a great variety in the colour of the topaz, ſome being a deeper yellow, and others ſlightly tinged, the proportions of the yellow glaſs to the white, may be accordingly varied at pleaſure: that here given being for the deepeſt.

No. 4. *Compoſition of paſte reſembling the topaz.*] "This may be done in the ſame manner as the preceding: but the ſalt-petre may be omitted in the original compoſition of the glaſs; and for the reſemblance of the very ſlightly coloured topazes, neither the gold coloured paſte, nor any other tinging matter, need be added, that of the lead being ſufficient, when not deſtroyed by the nitre."

No. 5. *Compoſition of hard glaſs reſembling the chryſolite.*] "Take of the compoſition for hard glaſs, No. 1. or No. 2. ten pounds, of calcined iron ſix drachms. Proceed as with the above."

No. 6. *Compoſition of paſte reſembling the chryſolite.*] "Take of the compoſition for paſte, No. 3. or No. 4. prepared without ſalt-petre, ten pounds, and of calcined iron five drachms. Proceed as with the reſt."

Compoſitions of hard glaſs, and paſte, of a green colour.

No. 1. *Compoſition of hard glaſs reſembling the emerald.*] "Take of the compoſition for hard glaſs, No. 1. or No. 2. nine pounds, of copper, precipitated from aquafortis, three ounces, and of precipitated iron two drachms."

No. 2. *Compoſition of paſte reſembling the emerald.*] "Take of the compoſition for paſte, No. 1. or No. 2. and proceed as with the above: but if the ſalt-petre be omitted in the preparation of the paſte, a leſs proportion of the iron will ſerve."

Compoſitions of glaſs, and paſtes, of a purple colour.

No. 1. *Compoſition of hard glaſs, of a deep, and very bright purple colour.*] "Take of the compoſition for hard glaſs, No. 1. or No. 2. ten pounds, of zaffer ſix drachms, of gold precipitated by tin one drachm. Proceed as with the reſt."

N. 2. *Cheaper compoſition of hard glaſs of a deep purple colour.*] "Take of the compoſitions for hard glaſs, No. 1. or No. 2. ten pounds, of magneſia one ounce, and of zaffer half an ounce. Proceed as with the others."

“ compoſition for hard glaſs, No. 1. or No. 2. ten “ pounds, of copper highly calcined with ſulphur “ three ounces, and of zaffer one ſcruple. Proceed “ as with the foregoing.”

No. 8. *Compoſition of paſte reſembling the eagle marine.*] “ Take of the compoſition for paſte, No. 1. “ or No. 2. ten pounds; and proceed as with the “ the above.”

Compoſitions of hard glaſs, and paſtes, of a yellow colour.

No. 1. *Compoſition of hard glaſs of gold, or full yellow colour.*] “ Take of the compoſitions for hard “ glaſs, No. 1. or No. 2. ten pounds, but omit the “ ſalt-petre; and for every pound add an ounce of “ calcined borax, or, if that do not render the glaſs “ ſufficiently fuſible, two ounces, of red tartar, the “ deepeſt coloured that can be procured, ten ounces; of magneſia two ounces; of charcoal of ſallow, or any other ſoft kind, two drachms. Proceed as with the reſt.”—This colour may be prepared with ſilver: but as there is no advantage in that to counterbalance the expence, I wave giving the proceſs.

N. 2 *Compoſition of paſte of a gold or full yellow colour.*] “ Take of the compoſition for paſte, No. 3. “ or No. 4. prepared without the ſalt-petre, ten “ pounds; of iron ſtrongly calcined, one ounce and “ a half. Proceed as with the others.”—The crude tartar and the charcoal muſt not be uſed, where lead enters into the compoſition of the glaſs; and the nitre may be ſpared; becauſe the yellow tinge given to the glaſs by the lead, on account of which the nitre is uſed, is no detriment in this caſe; but only adds to the proper colour. This colour may alſo be prepared by crude antimony, as well as the calcined iron: but it is more difficult to be managed, and not ſuperior in its effect.

No. 3. *Compoſition of hard glaſs reſembling the topaz.*] “ Take of the compoſition for hard glaſs, No. 1. or “ No. 2. ten pounds, and an equal quantity of the “ gold coloured hard glaſs. Powder; and fuſe them “ together.”—As there is a great variety in the colour of the topaz, ſome being a deeper yellow, and others ſlightly tinged, the proportions of the yellow glaſs to the white, may be accordingly varied at pleaſure: that here given being for the deepeſt.

No. 4. *Compoſition of paſte reſembling the topaz.*] "This may be done in the ſame manner as the pre-"ceding: but the ſalt-petre may be omitted in the "original compoſition of the glaſs; and for the re-"ſemblance of the very ſlightly coloured topazes, "neither the gold coloured paſte, nor any other "tinging matter, need be added, that of the lead "being ſufficient, when not deſtroyed by the nitre."

No. 5. *Compoſition of hard glaſs reſembling the chryſolite*] "Take of the compoſition for hard glaſs, "No. 1. or No. 2. ten pounds, of calcined iron ſix "drachms. Proceed as with the above."

No. 6. *Compoſition of paſte reſembling the chryſolite.*] "Take of the compoſition for paſte, No. 3. or No. "4. prepared without ſalt-petre, ten pounds, and "of calcined iron five drachms. Proceed as with "the reſt."

Compoſitions of hard glaſs, and paſte, of a green colour.

No. 1. *Compoſition of hard glaſs reſembling the emerald.*] "Take of the compoſition for hard glaſs, "No. 1. or No. 2. nine pounds, of copper, preci-"pitated from aquafortis, three ounces, and of pre-"cipitated iron two drachms."

No. 2. *Compoſition of paſte reſembling the emerald.*] "Take of the compoſition for paſte, No. 1. or No. "2. and proceed as with the above: but if the ſalt-"petre be omitted in the preparation of the paſte, "a leſs proportion of the iron will ſerve."

Compoſitions of glaſs, and paſtes, of a purple colour.

No. 1. *Compoſition of hard glaſs, of a deep, and very bright purple colour.*] "Take of the compoſition for "hard glaſs, No. 1. or No. 2. ten pounds, of zaf-"fer ſix drachms, of gold precipitated by tin one "drachm. Proceed as with the reſt."

N. 2. *Cheaper compoſition of hard glaſs of a deep purple colour.*] "Take of the compoſitions for hard "glaſs, No. 1. or No. 2. ten pounds, of magneſia one "ounce, and of zaffer half an ounce. Proceed as "with the others."

No. 3. *Compoſition of paſte of a deep purple colour.*] "Take of the compoſitions for paſtes, No. 3. or "No. 4. ten pounds; and treat them as the forego-"ing."

No. 4. *Compoſition of hard glaſs of the colour of the amethyſt.*] "Take of the compoſition for hard glaſs, "No. 1. or No. 2 ten pounds, of magneſia one "ounce and a half; and of zaffer one drachm. Pro-"ceed as with the reſt."

No. 5. *Compoſition of paſte of the colour of the amethyſt.*] "Take of the compoſition for paſte, No. 1. "or No. 2. ten pounds; and treat it as the preced-"ing."

Of paſte reſembling the diamond.] "Take of the "white ſand ſix pounds, of red-lead four pounds, "of pearl-aſhes, purified as above directed, three "pounds, of nitre two pounds, of arſenic five oun-"ces, and of magneſia one ſcruple. Proceed as "with the others: but continue the fuſion for a con-"ſiderable time, on account of the large proporti-"on of arſenic."—If this compoſition be thoroughly vitrified, and kept free from bubbles, it will be very white; and have a very great luſtre; but, if on examination it yet appear to incline to yellow, another ſcruple or more of the magneſia may be added. It may be rendered harder, by diminiſhing the proportion of lead; and increaſing that of the ſalts; or fuſing it with a very ſtrong fire: but the diminution of the proportion of lead will make it have leſs of the luſtre of the diamonds.

Compoſition of hard glaſs perfectly black.] "Take "of the compoſition for hard glaſs, No. 1. or No. "2. ten pounds, of zaffer one ounce, of magneſia, "and of iron ſtrongly calcined, each ſix drachms. "Proceed as with the reſt."

Compoſition of paſte perfectly black.] "Take of the "compoſition for paſte, No. 1. or No. 2. prepared "with the ſalt-petre, ten pounds, of zaffer one "ounce, of magneſia ſix drachms, and of iron high-"ly calcined five drachms. Proceed as with the "others."

No. 1.

Of the white opake, and ſemi-tranſparent glaſs, and paſtes.

No. 1. *Compoſition of white opake glaſs.* "Take "of the compoſition for hard glaſs, No. 1. or No. "2. ten pounds, of horn, ivory, or bone, calcined "perfectly white, one pound. Proceed as with the "others."

No. 2. *Compoſition of paſte of an opake whiteneſs.*] "Take of the compoſition, No. 3. or No. 4. ten "pounds, and make the ſame addition as to the "above."

No. 3. *Compoſition of glaſs of an opake whiteneſs formed by arſenic.*] "Take of flint-glaſs ten pounds, "and of very white arſenic one pound. Powder "and mix them thoroughly, by grinding them to"gether; and then fuſe them with a moderate heat, "till they be well incorporated: but avoid liquefy"ing them more, than to make a perfect union."— This glaſs has been made at a conſiderable work near London in great quantities; and has not only been manufactured into a variety of different kinds of veſſels, but, being very white and fuſible with a moderate heat, has been much uſed as a white ground for enamel in dial-plates, ſnuff-boxes, and other pieces, which have not occaſion to go ſeveral times into the fire to be finiſhed. It will not, however, bear repeated burnings, nor a ſtrong heat continued for any length of time, when applied to this purpoſe, without becoming tranſparent; to which, likewiſe, the ſmoke of a coal fire will alſo greatly contribute: but it anſwers the end very well in many caſes; though even in thoſe, enamel of the ſame degree of whiteneſs would be preferable; as this is always brittle, and of leſs firm and tenacious texture.

No. 4. *Compoſition of hard glaſs, or paſte, formed by calx of tin or antimony.*] "Take of any of the com"poſitions for hard glaſs, or paſtes, ten pounds, of "calcined tin, (commonly called putty,) or of an"timony, or tin calcined by means of nitre, one "pound and a half. Mix them well, by grinding "them together; and then fuſe them with a mode"rate heat."—The glaſs of this kind, made with the compoſition for paſtes, differs in nothing from white enamel, but in the proportion of the calx of tin, and antimony: and, if thoſe calxes be prepared with nitre, (without which they cannot be made to produce a pure whiteneſs in glaſs,) this compoſition will be more expence and trouble than thoſe above given, without any other advantage, than that it will bear the action of a much ſtronger and longer continued fire, without loſing its opacity in any degree, than the others.

No. 5. *Compoſition of ſemi-tranſparent white glaſs, and paſte, reſembling the opal.*] "Take of any of the "compoſitions for hard glaſs, or paſte, ten pounds, "of horn, bone, or ivory, calcined to a perfect "whiteneſs, half a pound. Proceed as with the "reſt.—This white hard glaſs is much the ſame with the German glaſs formerly brought here in porringers, cream-pots, vinegar-cruets, and other ſuch pieces, of which we frequently meet with the remains.

Compoſition of fictitious or counterfeit lapis lazuli.] "Take of any of the above compoſitions for hard "glaſs, or paſte, ten pounds, of calcined bones, "horn, or ivory, three quarters of a pound, of zaffer one ounce and a half, of magneſia half an "ounce. Fuſe the uncoloured compoſition with "the zaffer and magneſia, till a very deep tranſparent blue glaſs be produced. The maſs being "cold, powder it: and mix it with the calcined "matter, by grinding them together. After which, "fuſe them with a moderate heat, till they appear "to be thoroughly incorporated; and then form the "melted maſs into cakes, by pouring it on a clean "bright plate of copper or iron."—If it be deſired to have it veined with gold, it may be done, by mixing the gold powder with an equal weight of calcined borax, and tempering them with oil of ſpike; by which mixture, the cakes, being painted with ſuch veins as are deſired, they muſt be put into a furnace of a moderate heat; and the gold will be cemented to the glaſs, as firmly as if the veins had been natural. If the counterfeit lapis lazuli be deſired of a lighter hue, the quantity of zaffer, and magneſia, muſt be diminiſhed; or, if it be required to be more tranſparent, that of the calcined horn, bone, or ivory, ſhould be leſſened. Inſtead of zaffer, where that cannot be obtained, a proper proportion of ſmalt may be ſubſtituted. And in all caſes, indeed, it may be a more certain way, to form the zaffer and vitrifying ingredients into glaſs alone, and then, having powdered them with the calcined bones or horns, infuſe them a ſecond time, and make them into cakes in the manner directed. For the fluxing power of the ingredients of the glaſs is ſo retarded by the calcined bone or horn, that it may, in ſome caſes, fail to act ſufficiently on the zaffer to vitrify it perfectly.

Compoſition of hard glaſs reſembling the red cornelian.] " Take of the compoſitions for hard glaſs, No. 1. " or No. 2. two pounds, of glaſs of antimony one " pound, of the calcined vitriol, called ſcarlet oker, " two ounces, and of magneſia one drachm. Fuſe " the glaſs of antimony and magneſia with the other " glaſs firſt together; and then powder them well, " and mix them with the ſcarlet oker, by grinding " them together; and afterwards fuſe the mixture " with a gentle heat, till they be incorporated: but " the heat muſt not be continued longer than is ab" ſolutely required to form them into a vitreous " maſs."—If it be deſired to have the compoſition more tranſparent, a proportionable part of the red oker muſt be omitted.

Compoſition of paſte reſembling the red cornelian.] " Take of the compoſitions for paſtes, No. 1. or " No. 2. two pounds; and proceed as with the " above."

Compoſition of hard glaſs reſembling the white cornelian.] " Take of the compoſitions for hard glaſs, " No. 1. or No. 2. two pounds, of yellow oker " well waſhed, two drachms, and of calcined bones, " each one ounce. Mix them well by grinding them " together; and fuſe them with a gentle heat, till

" the ſeveral ingredients be well incorporated in a " vitreous maſs."

Compoſition of paſte reſembling the white cornelian.] " Take of the compoſition for paſtes, No. 1. or " No. 2. two pounds; and proceed as with the " foregoing."

Compoſition of hard glaſs, or paſte, reſembling the turquoiſe ſtone.] " Take of the compoſitions for blue " glaſs, or paſte, No. 7. or No. 8. (being thoſe re- " ſembling the eagle marine) ten pounds, of cal- " cined bone, horn, or ivory, half a pound. Pow- " der and mix them well; and then fuſe them in a " moderate heat, till they be thoroughly incorpo- " rated."—If the colour be not ſo deep as may be deſired, a ſmall proportion of ſmalt may be added.

Compoſition of the brown Venetian glaſs with gold ſpangles; commonly called the Philoſopher's ſtone.] " Take of the compoſition for hard glaſs, No. 2. " and the compoſition for paſte, No. 1. each five " pounds, and of highly-calcined iron one ounce. " Mix them well, and fuſe them till the iron be " perfectly vitrified; and have tinged the glaſs of a " deep tranſparent yellow brown colour. Powder " this glaſs; and add to it two pounds of glaſs of " antimony, being powdered; and mix them well, " by grinding them together. Take part of this " mixture, and rub into it fourſcore or one hundred " leaves of the counterfeit leaf gold, commonly cal- " led Dutch gold; and, when the parts of the gold " ſeem ſufficiently divided, mix the powder con- " taining it with the other part of the glaſs. Fuſe " the whole then with a moderate heat, till the " powder run into a vitreous maſs fit to be wrought " into any of the figures, or veſſels, into which it " is uſually formed: but avoid a perfect liquefacti- " on; becauſe that deſtroys, in a ſhort time, the " equal diffuſion of the ſpangles; and vitrifies, at " leaſt part, the matter of which they are compoſ- " ed; converting the whole to a kind of tranſparent " olive-coloured glaſs."—This kind of glaſs is uſed for a great variety of toys and ornaments with us, who, at preſent, procure it from the Venetians: and a few years ago a very great demand aroſe for it to China, and raiſed the price very high, till ſuch quantities had been brought from Venice, and ſent thither, as glutted the market. But there is no reaſon why it ſhould not be equally well prepared here; and at a ſmall expence; as will be found, on a few trials, by thoſe who will carefully execute what is here directed.

Of the fuſion and vitrification of the ſeveral compoſitions of coloured glaſs; with the particular rules and cautions to be obſerved in the management of each kind.] The ſeveral compoſitions above-mentioned being prepared according to the directions reſpectively gigen; the matter ſhould be put into proper pots, ſuch as are deſcribed p. 255, of which it ſhould not fill above two-thirds; and then placed in the furnace, of which the conſtruction is given p. 252; or in any other kind, where they may receive a ſufficient heat, and be ſecured from any coals, ſoot, or any other filth, falling into them. In order to prevent which, it is expedient, with regard to the pots in which this kind of glaſs is prepared, to have covers over the tops of them, with a little return over the ſide. And it is alſo proper to have a hole in the ſide a little below the return; through which an iron may be paſſed to take out a ſmall quantity of the melted matter, for the judging of the progreſs of the vitrification. Theſe pots, when put into the furnace abovementioned, ſhould be placed on the flooring or ſtage intended to ſupport them in the part betwixt the doors, oppoſite to that through which they are paſſed into the furnace, according to the manner before directed; which ſhould be done by means of a ſtrong iron peel, like thoſe uſed by the bakers. It is neceſſary to obſerve, likewiſe, that however well the pots may have been before baked, it is always proper, in the caſe of glaſs of greater value, where the clearneſs and beauty is of conſequence, to give them another burning before they be uſed; and, at the ſame time, to encruſt them over with any common colourleſs glaſs; which may be done in this manner. Having reduced the glaſs to powder, moiſten all the inſide of the pot with water; and, while it is yet moiſt, put in ſome of the powdered glaſs, and ſhake it about till the whole inner ſurface of the pot be covered by what will adhere to it, in conſequence of the moiſture. Throw out then the redundant part of the powdered glaſs; and, the pot being dry, ſet in a furnace ſufficiently hot to vitrify the glaſs adhering to it; and let it continue there ſome time: after which, care muſt be taken to let it cool gradually.

The pots, containing the compoſition, being thus placed in the furnace, a gentle heat, ſuch as will juſt keep the pots red hot, ſhould be given for the firſt hour or longer. There is, however, an exception to this, which is, where there is much arſenic in the compoſition, which requires that ſome degree of vitrification ſhould be brought on as quickly as poſſible, in order to fix it, and prevent its ſubliming away from the other ingredients; which it will not ceaſe to do, ſo long as continued in the ſtate of a powder. But where a gentler heat is proper at firſt, after the expiration of an hour and a half, or two hours at furtheſt, the heat may be raiſed ſufficiently to produce a vitrification; but not ſo as to render the melted matter very fluid at firſt; which in this part of the proceſs would occaſion a ſeparation of the ingredients; and greatly retard, if not intirely prevent, the perfect vitrific incorporation of the whole.

The due degree or continuance of heat, for the perfecting theſe kinds of glaſs, cannot be ſettled by any ſtandard, as they are varied both by the nature of the compoſition, and the quantity of the matter. But in the caſe of pots which hold ten or eleven pounds, twenty or twenty-four hours may be allowed for hard glaſs, and fourteen or ſixteen for paſtes. And where much arſenic enters into the compoſition, though it is neceſſary to bring on a quicker vitrification, yet more time muſt ſometimes be given to the matter, than in other caſes, before all the cloudineſs be diſſipated.

In the fuſion of the tranſparent coloured glaſs, it is above all things neceſſary to avoid ſtirring the matter, or even ſhaking the pots; as it would otherwiſe hazard the cauſing bubbles in the glaſs; to prevent which is the greateſt difficulty attending the preparation of counterfeit gems. But if the ingredients, by their action on each other, do yet, notwithſtanding all exterior concuſſion be avoided, produce bubbles, the glaſs muſt be continued in fuſion, till they wholly vaniſh. And if, when bubbles do ariſe in the glaſs, and time be given for it, there appear no tendency to their going away, the heat muſt be gradually raiſed to a greater pitch, that the glaſs may be rendered more fluid, and that viſcidity, which was the occaſion of their detention, removed.

When a proper time has been given the glaſs, to attain to a perfect ſtate of vitrefaction, it ſhould be examined, by putting the ſmall end of a tobacco-pipe to the ſurface of the glaſs, through the hole in the ſide of the pot; which will bring away with it a little quantity of the glaſs, from whence the qualities may be judged of. And if there appear any defects, that ſeem owing to the want of a due converſion of the ingredients to a vitreous ſtate, more time and heat muſt be given to it. But if no ſuch defects are found, and the glaſs appear perfect, the fire ſhould be decreaſed, and, by degrees, ſuffered to go out; and the pots continued in the ſurnace, till they become cold: after which, the pot ſhould be torn off from the maſs of glaſs contained in it. As, however, it is not always convenient to diſcontinue the heat of the furnace, when one or more pots of the glaſs may have attained to the due ſtate of vitrification; they may, on ſuch occaſions, be taken out. And if the glaſs be not of great value, nor intended for very nice purpoſes, it may be formed into cakes, by pouring it on a clean plate of iron or copper, or into rolls. Theſe cakes, or rolls, ſhould be put into a moderate heat, before they grow cold; and continued there for ſome time, that they may gain a good temper, ſo as to bear cutting or working in any way, according to the uſe they are intended for.

The tranſparent coloured glaſs is in moſt caſes improved, by continuing it in the heat, even for a conſiderable time after the vitrification ſeems perfected; as it is, by that means, rendered harder, and freer from ſpecks and bubbles. But the ſemi-tranſparent kinds, and opake white formed of arſenic, muſt be taken juſt at the point, when the ingredients are duly united; for a more mature vitrification converts to tranſparent glaſs the whole, or part of thoſe ſubſtances, which ſhould not be brought to that ſtate. But as I have before intimated in what particular caſes this requires to be moſt attended to, it is needleſs to enlarge further on the matter here.

Of colouring rock chryſtals for the imitation of gems.] The far greater hardneſs of chryſtal than of any kind of glaſs, and the ſuperior luſtre of it to any but paſtes, which are deplorably ſoft, have rendered the art of imparting to it the colours of gems, an object of frequent and eager purſuit: as great advantages might probably have ariſen from it to the firſt inventors. There are two methods, by which it has been conceived there was a poſſibility of doing it: the one, by cementing; that is, impregnating the chryſtals by means of heat, with the proper tinging particles, under the form of ſteam: the other, by bringing the chryſtal to a ſtate of fuſion, through the means of heat aided by a ſtrong flux; and combining it in that ſtate with the proper colouring ſubſtances. Both of theſe have been pretended to be effected in a perfect manner: and very oſtentatious accounts of them have been given to the public: tho' it is much to be feared, that ſo far from having carried this art to any degree of perfection, there is not hitherto known one ſingle fact, or principal, that in the leaſt ſeems to lead to the attainment of it. As the world has been made to believe, however, as well more lately as formerly, by perſons of ſome authority, that both theſe methods have been practiſed with all the deſired ſucceſs, I will exhibit the particular manner in which each has been practiſed, by thoſe who have been believed to be moſt the maſters of theſe arts.

" Take of very yellow orpiment, and white arſe-
" nic, each two ounces, and of antimony and ſal
" ammoniacum each one ounce; and having redu-
" ced them to powder, mix them well together, and
" put them into a large crucible. Over this mix-
" ture, lay the pieces of rock chryſtal; firſt ſuch as
" are of the leaſt ſize, then larger, and at the top
" the biggeſt; taking care, that thoſe choſen for
" this purpoſe have no flaws nor foulneſs. This
" crucible muſt then be covered by a leſſer turned
" upſide down upon it, in the bottom of which,
" there ſhould be previouſly made a little opening
" of the bigneſs of a pea; in order that this bot-
" tom, becoming now the top of the veſſel, formed
" by joining the two together, the fumes of the
" matter contained may have vent through the hole;
" and, conſequently, being determined upwards,
" may paſs through the chryſtals, and act upon them.
" The joints produced by inverting the leſſer cruci-
" ble into the greater ſhould be luted; and being
" dry, the veſſel thus formed muſt be put in the
" midſt of pieces of charcoal, in ſuch manner, that
" the undermoſt crucible may be buried in them in-
" tirely; and the uppermoſt half way. The coals
" muſt then be kindled, and the fire ſuffered to burn
" very gradually without blowing, unleſs it ſhould
" be neceſſary to keep it from extinguiſhing; to
" prevent which from happening too ſoon, the pie-
" ces of charcoal ſhould be choſen large. As the
" fire riſes, the mixture in the crucible will emit co-
" pious fumes: which being very noxious, muſt be
" carefully avoided: and to that end this operation
" ſhould be always performed under a chimney; the
" front of which ſhould be brought ſo low, that all
" the ſmoke may be determined up it; and not
" ſpread itſelf in the elaboratory, or other place.
" The fire muſt be kept up ſo long as any of theſe

" fumes appear to riſe; and then permitted to go
" gradually out; and all acceſs of cold air muſt be
" cautiouſly prevented. When the crucibles are
" grown intirely cold, but not before, the upper-
" moſt may be taken off; and the chryſtal will be
" found coloured, ſome pieces like topazes, and
" ſome like rubies, and a variety of other ſtones."

It has been ſaid, that the chryſtals thus coloured have been cut; and produced fine imitations of the true ſtones: but the truth of the matter is, (notwithſtanding all pretenſion to more) that they do appear, when taken out of the crucible, to be well coloured and beautiful; yet on further examination it is found, that the whole effect is produced by a fallacious cauſe. For the chryſtals being cracked by the heat, as is almoſt univerſally the conſequence of being expoſed to this degree of it, the fumes having inſinuated themſelves into theſe cracks, and there producing the ſame effect as the paint uſed betwixt the two tables of doublets, the whole ſubſtance of the ſtone has the appearance of being tinged. But on due inſpection, nevertheleſs, the chryſtals are found to be neither fit to be cut, on account of the flaws, nor to have acquired any colour, but what would inſtantly be deſtroyed on the ſeparation of the ſeveral parts of the ſtones, into which they are divided by the cracks: ſo that this method, together with many others of the ſame kind for giving colours to chryſtals by cementation, will be found to elude the hopes of thoſe, who try them with any confidence.

The other pretended method of colouring chryſtals, by fuſing them, and imparting the various tinges to them, while in a melted ſtate, is thus performed.

" Take of rock chryſtals any quantity; and put
" them in a covered crucible in a ſtrong fire; where
" they muſt be continued for ſome time. Remove
" the crucible then out of the fire; and immediate-
" ly throw the chryſtals into a veſſel of clean cold
" water: from whence being again collected, they
" muſt be recalcined; and afterwards thrown into
" freſh

“ freſh water again in the ſame manner: and this
“ operation muſt be repeated, till the chryſtals be ſo
“ changed in their texture, by the flaws and cracks
“ produced by the ſudden change from heat to cold,
“ that they may be eaſily levigated. Powder the
“ chryſtals thus calcined; and, to three pounds of
“ them, add two pounds of purified pearl-aſhes, or
“ a pound and a quarter of red lead, together with
“ any of the tinging ſubſtances above-mentioned,
“ in the proportion directed for colouring glaſs or
“ paſtes; and fuſe them in the ſame manner, alſo,
“ as has been before adviſed for other compoſitions.
“ If the matter be found too difficult to be brought
“ to a vitreous ſtate, by this proportion of pearl-
“ aſhes or lead, borax or arſenic may be added, as
“ in other caſes, in order to form a more powerful
“ flux.”

The chryſtal thus treated produces however nothing more than a glaſs exactly of the ſame kind with that formed of the Lynn ſand; which is in fact no other than a groſs powder of chryſtal; and neither of them differ very eſſentially from ſuch calcined flints, as are wholly free from colour. The ſuppoſition, therefore, that the chryſtal can be fuſed by this means, and being tinged while in that ſtate, reduced afterwards to its original hardneſs, is wholly groundleſs. For it cannot be fuſed by the heat of furnaces without the medium of ſome fluxing body added to it; and then its texture and properties are ſo changed, or rather the glaſs produced by the compoſition is ſo different from the chryſtal itſelf, that there does not appear to be the leaſt advantage in employing rock chryſtal, in forming ſuch a compoſition, preferably to flints; even if they could be procured at the ſame expence; and required no greater trouble or labour in their uſe.

Of doublets.] The impracticability of imparting tinges to the body of chryſtals, while in their proper and natural ſtate, and the ſoftneſs of glaſs which renders ornaments made of it greatly inferior in wear to chryſtal, gave inducements to the introduction of colouring the ſurface of chryſtal, wrought into a proper form in ſuch manner, that the ſurfaces of two pieces ſo coloured being laid together, the effect might appear the ſame, as if the whole ſubſtance of the chryſtal had been tinged. The chryſtals (and ſometimes white tranſparent glaſs) ſo treated, were called doublets: and at one time prevailed greatly in uſe, on account of the advantages, with reſpect to wear, ſuch doublets had, when made of chryſtal, over glaſs, and the brightneſs of the colours, which could with certainty be given to counterfeit ſtones this way, when coloured glaſs could not be procured; or at leaſt not without a much greater expence. Doublets have not indeed the property which the others have of bearing to be ſet tranſparent; as is frequently required in drops of ear-rings and other ornaments. But when mounted in rings, or uſed in ſuch manner, that the ſides of the pieces, where the joint is made, cannot be inſpected, they have, when formed of chryſtal, the title to a preference to the coloured glaſs: and the art of managing them is therefore in ſome degree of the ſame importance with that of preparing glaſs for the counterfeiting gems; and is therefore properly an appendix to it, as being intirely ſubſervient to the ſame intention. The manner of managing doublets is as follows.

Let the chryſtal or glaſs be firſt cut by the lapidaries in the manner of a brilliant; except that, in this caſe, the figure muſt be compoſed from two ſeparate ſtones, or parts of ſtones formed in the manner of the upper and under parts of a brilliant, if it was divided in an horizontal direction, a little lower than the middle. After the two plates of the intended ſtone are thus cut, and fitted ſo exactly, that no diviſion can appear when they are laid together, the upper part muſt be poliſhed ready for ſetting; and then the colour muſt be put betwixt the two plates by this method.

“ Take of Venice or Cyprus turpentine two ſcruples; and add to it one ſcruple of the grains of
“ maſtic choſen perfectly pure, and free from foul-

" neſs, and previouſly powdered. Melt them toge-
" ther in a ſmall ſilver or braſs ſpoon ladle, or other
" veſſel, and put to them gradually any of the co-
" loured ſubſtances below mentioned, being firſt
" well powdered; ſtirring them together as the co-
" lour is put in, that they may be thoroughly com-
" mixt. Warm then the doublets to the ſame de-
" gree of heat, as the melted mixture; and paint
" the upper ſurface of the lower part; and put the
" upper one inſtantly upon it; preſſing them to each
" other; but taking care that they may be conjoin-
" ed in the moſt perfectly even manner. When the
" cement or paint is quite cold, and ſet, the redun-
" dant part of it, which has been preſſed out of the
" joint of the two pieces, ſhould be gently ſcraped
" off the ſide, till there be no appearance of any co-
" lour on the outſide of the doublets: and they
" ſhould then be ſkilfully ſet; obſerving to carry
" the mounting over the joint, that the upper piece
" may be well ſecured from ſeparating from the un-
" der one."

The colour of the ruby may be beſt imitated, by mixing a fourth part of carmine with ſome of the fineſt crimſon lake that can be procured: which may be beſt made for this purpoſe of Braſil wood.

The ſapphire may be counterfeited by very bright Pruſſian blue, mixt with a little of the above-mentioned crimſon lake, to give it a caſt of the purple. The Pruſſian blue ſhould not be very deep coloured, or but little of it ſhould be uſed: for otherwiſe, it will give a black ſhade that will be injurious to the luſtre of the doublets.

The emrald may be well counterfeited by diſtilled verdigriſe, with a little powdered aloes. But the mixture ſhould not be ſtrongly heated, nor kept long over the fire after the verdigriſe is added: for the colour is apt to be ſoon impaired by it.

The reſemblance of the garnet may be made by dragon's blood: which, if it cannot be procured of ſufficient brightneſs, may be helped by a very ſmall quantity of carmine.

The vinegar garnet may be imitated with great ſucceſs by the orange lake.

The amethiſt may be counterfeited by the mixture of ſome Pruſſian blue, with the crimſon lake: but the proportions can only be regulated by diſcretion; as different parcels of the lake and Pruſſian blue vary extremely in the degree of ſtrength of the colour.

The yellow topazes may be imitated, by mixing the powdered aloes with a little dragon's blood; or by good Spaniſh anatto: but the colour muſt be very ſparingly uſed, or the tinge will be too ſtrong for the appearance of that ſtone.

The chryſolite, hyacinth, vinegar garnet, eagle marine, and other ſuch weaker or more diluted colours, may be formed in the ſame manner, by leſſening the proportions of the colours, or by compounding them together correſpondently to the hue of the ſtone to be imitated; to which end it is proper to have an original ſtone, or an exact imitation of one at hand, when the mixture is made; in order to the more certain adapting the colours to the effect deſired. When theſe precautions are taken, and the operation well conducted, it is practicable to bring the doublets to ſo near a reſemblance of the true ſtones, that even the beſt judges cannot diſtinguiſh them, when well ſet, without a peculiar manner of inſpection.

Where any kind of lake, or Pruſſian blue, is uſed for this purpoſe, it is beſt to grind or levigate it with ſpirit of turpentine inſtead of water: which will prevent its concreting again as it dries. The dragon's blood may be levigated with water: but the diſtilled verdigriſe muſt be powdered dry. All the ſubſtances uſed as tinges for doublets or foils muſt, however, be powdered as finely as poſſible: the brightneſs of the counterfeit ſtones for which they are uſed depending very greatly on that.

There is, however, an eaſy method of diſtinguiſhing doublets: which is only to hold them betwixt the eye and light, in ſuch poſition, that the light may paſs through the upper part, and corners of the ſtone; which will then ſhew ſuch parts to be white; and that there is no colour in the body of the ſtone.

Of the general nature and preparation of foils.] Foils are thin plates or leaves of metal, that are put under ſtones, or compoſitions in imitation of ſtones, when they are ſet.

The intention of foils is, either to increaſe the luſtre or play of the ſtones, or more generally to improve the colour, by giving an additional force to the tinge, whether it be natural or artificial, by that of a ground of the ſame hue; which the foil is in this caſe made to be.

There are conſequently two kinds of foils. The one is colourleſs; where the effect of giving luſtre or play to the ſtone is produced by the poliſh of the ſurface, which makes it act as a mirror; and, by reflecting the light, prevent that deadneſs which attends the having a duller ground under the ſtone; and brings it, by the double refraction of the light that is cauſed, nearer to the effect of the diamond. The other is coloured with ſome pigment or ſtain of the ſame hue as the ſtone; or of ſome other, which is intended to modify and change the hue of the ſtone in ſome degree; as, where a yellow foil may be put under green, which is too much inclining to the blue; or under crimſon, where it is deſired to have the appearance more orange or ſcarlet.

Foils may be made of copper or tin: and ſilver has been ſometimes uſed; with which it has been adviſed, for ſome purpoſes, to mix gold; but the expence of either is needleſs, as copper may be made to anſwer the ſame end.

Where coloured foils are wanted, copper may, therefore, be beſt uſed; and may be prepared for the purpoſe by the following means.

" Take copper plates beaten to a proper thick-
" neſs; and paſs them betwixt a pair of fine ſteel
" rollers very cloſe ſet; and draw them as thin as is
" poſſible to retain a proper tenacity. Poliſh them
" then with very fine whiting, or rotten ſtone, till
" they ſhine, and have as much brightneſs as can
" be

"be given them; and they will then be fit to receive the colour."

But where the yellow or rather orange colour of the ground would be injurious to the effect, as in the caſe of purples, or crimſon red, the foil ſhould be whitened, which may be done by ſilvering it in the following manner.

" Take a ſmall quantity of ſilver; and diſſolve it in aquafortis; and then put bits of copper into the ſolution, to precipitate the ſilver; which being thus precipitated, the fluid muſt b epoured off; and freſh water added to it, to waſh away all the remainder of the firſt fluid: after which the ſilver muſt be dried. An equal weight of cream of tartar, and common ſalt, muſt then be ground with it, till the whole be reduced to a very fine powder: and with this mixture, the foils, being firſt ſlightly moiſtened, muſt be rubbed by the finger, or a bit of linen rag, till they be of the degree of whiteneſs deſired: after which, if it appear to be wanted, the poliſh muſt be refreſhed"

Inſtead of rolling, the more general practice is, to beat the copper plates, previouſly heated, betwixt two flat irons on an anvil, till they become of the thickneſs required; and then to give them an even ſurface, by a planiſhing hammer, before they are poliſhed: but the uſe of the rollers is much more expeditious, and effectual, where the quantity demanded can defray the expence of purchaſing them, with the other neceſſary work.

The tin foils are only uſed in the caſe of colourleſs ſtones, where quickſilver is employed: and they may be drawn out by the ſame rollers; but need not be further poliſhed; as that effect is produced by other means in this caſe.

Of the colouring foils.] There have been two methods invented for colouring foils: the one by tinging the ſurface of the copper of the colour required, by means of ſmoke: the other by ſtaining or painting it with ſome pigment, or other colouring ſubſtance.

ſtance. The firſt is limited only to colours where blue is prevalent, and, being troubleſome and uncertain in the production, is not, on the whole, ſo eligible, in any caſe, as the latter: and I ſhall, therefore, omit giving any directions for the practice of it; as all colours deſired may be given to the foils by the other method: that is, by laying a pigment or other colouring ſubſtance on the ſurface, by means of ſome proper vehicle that may ſerve for ſpreading it, and fixing it to the copper as a cement.

The colours uſed for painting foils, may be tempered with either oil; water rendered duly viſcid by gum arabic, or ſize; or varniſh: and as there is no preference of one method to the other, but in particular caſes, it is beſt to perſue all of them, according to the occaſions that may be beſt ſerved. Where deep colours are wanted, oil is moſt proper; becauſe ſome pigments become wholly tranſparent in it; as lake or Pruſſian blue: but yellow and green may be better laid on in varniſh, as the yellow may be had in perfection from a tinge wholly diſſolved in ſpirit of wine, in the ſame manner as in the caſe of laquers; and the moſt beautiful green is to be produced by diſtilled verdigriſe, which is apt to loſe its colour, and turn black with oil. In common caſes, however, any of the colours may be, with leaſt trouble, laid on with iſinglaſs ſize, in the ſame manner as the glazing colours uſed in miniature painting; for which, ample directions will now be given. The beſt method of adapting foils to all the ſeveral purpoſes, is as follows.

For red, where the ruby is to be imitated, carmine, with a little lake uſed in iſinglaſs ſize, or ſhell-lac varniſh, is to be employed, if the glaſs or paſte be of a full crimſon, verging towards the purple. But if the glaſs incline to the ſcarlet, or orange, very bright lake (that is not purple) may be uſed alone in oil.—For the garnet red, dragon's blood, diſſolved in ſeed-lac varniſh, may be uſed:—and for the

vinegar

vinegar garnet, the orange lake, tempered with ſhell-lac varniſh, will be found excellent.

For the amethyſt, lake, with a little Pruſſian blue, uſed with oil, and very thinly ſpread on the foil, will completely anſwer the end.

For blue, where a deep colour, or the effect of the ſapphire is wanted, Pruſſian blue, that is not too deep, ſhould be uſed in oil: and it ſhould be ſpread more or leſs thinly on the foil, according to the lightneſs or deepneſs of which the colour is required to be.—For the eagle marine, common verdigriſe, with a little Pruſſian blue, tempered in ſhell-lac varniſh, may be uſed.

For yellow, where a full colour is deſired, the foil may be coloured with yellow laquer, laid on as for other purpoſes: and for the ſlighter colour of topazes, the burniſh and foil itſelf will be ſufficiently ſtrong without any addition.

For green, where a deep hue is required, the chryſtals of verdigriſe, tempered in ſhell-lac varniſh, ſhould be uſed: but where the emerald is to be imitated, a little yellow laquer ſhould be added, to bring the colour to a truer green, and leſs verging to the blue.

The ſtones of more diluted colour, ſuch as the amethyſt, topaz, vinegar garnet, and eagle marine, may be very cheaply imitated by tranſparent white glaſs, or paſte, even without foils. This is to be done, by tempering the colours above enumerated with turpentine and maſtic, treated in the manner directed as before, for doublets; and painting the ſocket in which the counterfeit ſtone is to be ſet with the mixture; as well that as the ſocket and ſtone itſelf being previouſly heated. In this caſe, however, the ſtone ſhould be immediately ſet; and the ſocket cloſed upon it, before the mixture cool and grow hard.

The orange lake, above-mentioned, was invented for this purpoſe, in which it has a beautiful effect; and was uſed with great ſucceſs by a conſiderable manufacturer. The colour it produces is that of the vinegar garnet; which it affords with great brightneſs.

The colours, above directed to be uſed in oil, ſhould be extremely well ground in oil of turpentine, and tempered with old nut or poppy oil: or, if time can be given for their drying, with ſtrong fat oil diluted with ſpirit of turpentine, which will gain a fine poliſh of itſelf.

The colours uſed in varniſh ſhould be, likewiſe, thoroughly well ground and mixt: and, in the caſe of the dragon's blood, in the ſeed lac varniſh and the laquer, the foils ſhould be warmed before they are laid on.

All the mixtures ſhould be laid on the foils with a broad ſoft bruſh; which muſt be paſſed from one end to the other; and no part ſhould be croſt, or twice gone over; or, at leaſt, not till the firſt coat be dry; when, if the colour do not lie ſtrong enough, a ſecond coat, or even a third, may be given.

Of foils for chryſtals, pebbles, or paſte, to give the luſtre and play of diamonds.] The manner of preparing foils, ſo as to give colourleſs ſtones the greateſt degree of play and luſtre, is, by raiſing ſo high a poliſh or ſmoothneſs on the ſurface, as to give them the effect of a mirror; which can only be done in a perfect manner by the uſe of quickſilver applied in the ſame general way, as in the caſe of looking-glaſs. The method by which it may be beſt performed is as follows.

" Take leaves of tin, prepared in the ſame manner as for ſilvering looking-glaſſes; and cut them into ſmall pieces of ſuch ſize as to cover the ſurface of the ſocket of the ſtones that are to be ſet. Lay three of theſe then one upon another; and, having moiſtened the inſide of the ſocket with thin gum water, and ſuffered it to become again ſo dry, that only a ſlight ſtickineſs remains, put the three pieces of leaves, lying on each other, into it, and adapt them to the ſurface, in as even a manner as poſſible. When this is done, heat the ſocket, and fill it with warm quickſilver;

" which muſt be ſuffered to continue in it three or
" four minutes, and then gently poured out. The
" ſtone muſt then be thruſt into the ſocket, and
" cloſed with it; care having been taken to give
" ſuch room for it, that it may enter without ſtripping
" off the tin and quickſilver from any part of
" the ſurface. The work ſhould be well cloſed
" round the ſtone, to prevent the tin and quickſilver,
" contained in the ſocket, from being ſhaken
" out by any violence."

The luſtre of ſtones, ſet in this manner, will continue longer, than when they are ſet in the common way; as the cavity round them being filled in this manner, there will be no paſſage found for moiſture; which is ſo injurious to the wear of ſtones treated in any other way.

This kind of ſoil gives ſome luſtre to glaſs, or other tranſparent matter, which has little of itſelf: but to ſtones, or paſtes, that have ſome ſhare of play, it gives a moſt beautiful brilliance. It has been but little practiſed hitherto; I ſuppoſe from an ignorance of the manner of doing it: for, indeed, I never heard of more than one perſon, who is now gone from this country, who performed it to perfection: but he gave the ſtones a ſurprizing luſtre, that made them not diſtinguiſhable from diamonds even by day-light. There is, nevertheleſs, at preſent, one diſadvantage attending this method, as it is now practiſed: which is, that it can be only performed in the caſe of ſtones with a flat bottom. In conſequence of which, the roſe or table diamonds, only, can be imitated by it. But though the manner of doing it has not been hitherto diſcovered, yet it is certainly not impoſſible to contrive ſome way of ſetting ſtones of the cut of brilliants in this manner: in which caſe, if any of the chryſtal ſpecies, ſuch as thoſe called Briſtol ſtones, Kerry ſtones, &c. were to be uſed, their far greater hardneſs, as well as much higher luſtre, when treated in this way, would render them far ſuperior to paſtes.

Of Cements.

CEMENTS require to be of very various compoſitions, and different with reſpect to the nature of the ingredients, according to the different manner in which they are to be applied; and the ſubſtances they are to conjoin. The kinds of cement uſed for common purpoſes paſs under the denomination of glues, ſizes, paſtes, and lutes: but ſome, that are uſed for extraordinary occaſions, retain only the general name of cements.

Of common glue.] Common glue is formed by extracting the gelatinous part of cuttings or ſcraps of coarſe leather, or the hides of beaſts: but this being carried on as a groſs manufacture by thoſe who make it their proper buſineſs, the giving a more particular account of the method practiſed would be deviating from the proper deſign of this work.

Preparation of iſinglaſs glue.] "Iſinglaſs glue is "made by diſſolving beaten iſinglaſs in water by "boiling; and, having ſtrained it through a coarſe "linen cloth, evaporating it again to ſuch a conſiſtence, "that, being cold, the glue will be perfectly "hard and dry."——A great improvement is ſaid to be made in this glue by adding ſpirit of wine or brandy to it after it is ſtrained, and then renewing the evaporation till it gain the due conſiſtence. Some ſoak the iſinglaſs in the ſpirit or brandy for ſome time before it is diſſolved, in order to make the glue; and add no water, but let the ſpirit ſupply the place of it. But it is not clear, from trial, that either of theſe practices render the glue better. This iſinglaſs glue is far preferable to common glue for nicer purpoſes; being much ſtronger, and leſs liable to be ſoftened either by heat or moiſture.

Preparation of parchment glue.] "Take one pound "of parchment; and boil it, in ſix quarts of water, "till the quantity be reduced to one quart: ſtrain "off the fluid from the dregs; and then boil it "again, till it be of the conſiſtence of glue."—— The ſame may be done with glovers cuttings of leather, which make a colourleſs glue, if not burnt in the evaporation of the water.

Preparation of a very ſtrong compound glue.] "Take "common glue in very ſmall or thin bits, and iſin- "glaſs glue; and infuſe them in as much ſpirit of "wine as will cover them, for at leaſt twenty-four "hours. Then melt the whole together; and, "while they are over the fire, add as much powder- "ed chalk as will render them an opake white."— The infuſion in the ſpirit of wine has been directed in the recipes given for this glue; but the remark on the uſe of it in the preceding article will hold good alſo in this: and the mixture may be made with water only.

Preparation of a very ſtrong glue that will reſiſt moiſture.] "Diſſolve gum ſanderac, and maſtic, of "each two ounces, in a pint of ſpirit of wine; ad- "ding about an ounce of clear turpentine. Then "take equal parts of iſinglaſs, and parchment glue, "made according to the directions in the preceding "article; and, having beaten the iſinglaſs into ſmall "bits, as for common uſes, and reduced the glue "to the ſame ſtate, pour the ſolution of the gums "upon them; and melt the whole in a veſſel well "covered; avoiding ſo great a heat as that of boil- "ing water. When melted, ſtrain the glue through "a coarſe linen cloth; and then putting it again "over the fire, add about an ounce of powdered "glaſs."——This preparation may be beſt managed in balneo mariæ, which will prevent the matter burning to the veſſel; or the ſpirit of wine from taking fire: and indeed it is better to uſe the ſame method for all the evaporations of nicer glues, and ſizes; but, in that caſe, leſs water than the proportion directed, ſhould be added to the materials. A very ſtrong glue, that will reſiſt water, may be alſo made by adding half a pound of common glue or iſinglaſs glue to two quarts of ſkimmed milk, and then evaporating the mixture to the due conſiſtence of the glue.

Preparation of lip glue, for extemporaneouſly cementing paper, ſilk, and thin leather, &c.] "Take of iſinglaſs glue, and parchment glue, each one ounce, "of ſugar-candy, and gum tragacanth, each two "drachms. Add to them an ounce of water, and "boil the whole together, till the mixture appear, "when cold, of the proper conſiſtence of glue. "Then form it into ſmall rolls, or any other figure, "that may be moſt convenient."—This glue being wet with the tongue, and rubbed on the edges of the paper, ſilk, &c. that are to be cemented, will, on their being laid together, and ſuffered to dry, unite them as firmly as any other part of the ſubſtance.

Of ſizes.] Common ſize is manufactured in the ſame manner, and generally by the ſame people, as glue. It is indeed glue left in a moiſture ſtate, by diſcontinuing the evaporation before it is brought to a dry conſiſtence: and therefore further particulars reſpecting the manufacture of it are needleſs here.—Iſinglaſs ſize may alſo be prepared, in the manner above directed for the glue, by increaſing the proportion of the water for diſſolving it: and the ſame holds good of parchment ſize. A better ſort of the common ſize, which may be likewiſe made by treating cuttings of glovers leather in the ſame manner.

Of paſtes.] Paſte for cementing is formed principally of wheaten flour boiled in water till it be of a glutinous or viſcid conſiſtence. It may be prepared of thoſe ingredients ſimply for common purpoſes: but when it is uſed by book-binders, or for paper hangings to rooms, it is uſual to mix a fourth, fifth or ſixth of the weight of the flour of powdered reſin; and where it is wanted ſtill more tenacious, gum arabic, or any kind of ſize, may be added. In order to prevent the paſte uſed for hanging rooms with paper, or where it is employed in any other way that may render it ſubject to ſuch accidents, from being knawed by rats and mice, powdered glaſs is ſometimes mixt with it. But the moſt effectual and eaſy remedy is to diſſolve a little ſublimate, in the proportion of a drachm to a quart, in the water employed for making the paſte; which will hinder, not only rats and mice, but any other kind of vermin and inſects, from preying on the paſte.

Of lutes.] Lutes are cements employed for making good the joints of glaſſes put together, or other ſuch purpoſes, in chemical operations. In a general view, the preparation of them properly belongs to the art of chemiſtry only: but as they are nevertheleſs ſometimes uſed in other arts, it may be expedient to ſhew here the manner of compounding them. In the making good junctures, where the heat is not ſufficient to burn paper or vegetable ſubſtances, the following mixture, which is eaſily made, will effectually anſwer the purpoſe. Take a mixture of linſeed meal or wheaten flour and whiting, in the proportion of one part of the firſt to two of the laſt, tempered with a ſolution of gum Senegal or Arabic in water, and ſpread upon the joint, a narrow piece ſmeared with the ſame being put over it and preſſed cloſe. A piece of bladder ſmeared with gum water, or the glair of eggs, and fitted to the glaſſes over the joint, will alſo anſwer the ſame end. But in the rectification of ſpirit of wine, or other ſuch volatile ſubſtances, where the waſte made by the eſcape of the vapour may be material, a ſtronger lute formed of quicklime, tempered to a proper conſiſtence with drying oil, ſhould be uſed. This mixture ſhould be made at the time it is wanted, as it very ſoon becomes dry and untractable: and great care muſt be taken, where it is employed, to manage the heat in ſuch manner, that the vapour may not riſe ſo faſt as to heat the veſſels beyond the due point; for this lute renders the glaſſes joined together by it as one intire body; and will reſiſt the expanſive force of the vapour to ſo great a degree, that the glaſſes will frequently burſt before it will give way. Where lute is to be uſed in places liable to be ſo heated as to burn vegetable or animal ſubſtances, it may be thus compounded. Take two parts of green vitriol calcined to redneſs, one part of the ſcoria or clinkers of a ſmith's forge well levigated, and an equal quantity of Windſor loom or Sturbridge clay dried and powdered: temper them to a proper conſiſtence with the blood of any beaſt; ſome ſhort hair, of which the proportion may be as a twentieth part to the whole, being beaten up with them, and ſpread them over the juncture. In caſes of little importance, a compoſition of ſand, clay, and dung of horſes tempered with water, may be uſed.

Preparation of cement for joining broken glaſſes, china, &c.] The cement, which has been moſt approved for uniting glaſs, china, or earthen ware, as alſo the parts of metalline bodies (where ſoldering is not expedient) is thus prepared.—" Take two ounces of " good glue, and ſteep it for a night in diſtilled vi-" negar: boil them together the next day; and " having beaten a clove of garlic with half an ounce " of ox-gall into a ſoft pulp, ſtrain the juice through " a linen cloth, uſing preſſure, and add it to the " glue and vinegar. Take then of ſanderac pow-" dered, and turpentine, each one drachm, and of " ſarcocol, and maſtic, powdered, each half a " drachm; and put them into a bottle with an " ounce of highly rectified ſpirit of wine. Stop " the bottle; and let the mixture ſtand for three " hours in a gentle heat; frequently ſhaking it. " Mix this tincture alſo with the glue while hot; " and ſtir them well together with a ſtick or tobac-" co-pipe, till part of the moiſture be evaporated; " and then take the compoſition from the fire; and " it will be fit for uſe. When this cement is to be " applied, it muſt be dipt in vinegar; and then " melted in a proper veſſel, with a gentle heat; and " if ſtones are to be cemented, it is proper to mix " with it a little powdered tripoli or chalk; or, if " glaſs is to be conjoined, powdered glaſs ſhould " be ſubſtituted."—I ſee no reaſon why common vinegar ſhould not be equally proper for this purpoſe with the diſtilled; nor indeed am I very certain that vinegar improves at all the cementing property of the compoſition. For the uniting the parts of broken china or earthen-ware veſſels, as alſo glaſs where the rendering the joint viſible is not of conſequence, the following compoſition, which is much more eaſily prepared, may be ſubſtituted for the foregoing.—" Take an ounce of Suffolk cheeſe, or any " other kind devoid of fat: grate it as ſmall as poſ-" ſible; and put it, with an equal weight of quick-" lime, into three ounces of ſkimmed milk. Mix " them thoroughly together; and uſe the compoſi-" tion immediately."—Where the broken veſſels are for ſervice only, and the appearance is not to be regarded, the joints may be made equally ſtrong with any other part of the glaſs, by putting a ſlip of thin paper, or linen, ſmeared with this cement, over them, after they are well joined together by it. This method will make a great ſaving in the caſe of glaſſes employed for chemical, or other ſimilar operations. A cement of the ſame nature may be made by tempering quicklime with the curd of milk, till it be of a due conſiſtence for uſe. The curd, in this caſe, ſhould be as free as poſſible from the cream or oil of the milk. On this account it ſhould be made of milk from which the cream has been well ſkimmed off; or the kind of curd commonly ſold in the markets, made of whey, and the milk from which butter has been extracted, commonly called buttermilk. This cement ſhould be uſed in the ſame manner as the preceding: and they may be applied to ſtones, marble, &c. with equal advantage as the more compound one above given, and is much more eaſily and cheaply prepared. Drying oil with white lead is alſo frequently uſed for cementing china, and earthen-ware: but where it is not neceſſary the veſſels ſhould endure heat or moiſture, iſinglaſs glue with a little tripoli or chalk is better.

Preparation of common cement for joining alabaſter, marble, porphyry, or other ſtones.] " Take of bees " wax two pounds, and of reſin one pound. Melt " them; and add one pound and a half of the ſame " kind of matter powdered, as the body to be ce-

" mented is compoſed of; ſtrewing it into the melted mixture, and ſtirring them well together; and
" afterwards kneading the maſs in water, that the
" powder may be thoroughly incorporated with the
" wax and reſin. The proportion of the powdered
" matter may be varied, where required, in order
" to bring the cement nearer to the colour of the
" body on which it is employed."——This cement muſt be heated when applied; as muſt alſo the parts of the ſubject to be cemented together; and care muſt be taken, likewiſe, that they be thoroughly dry. It appears to me, that the proportion of the bees wax is greater than it ought to be: but I received this recipe from too good an authority to preſume to alter it. When this compoſition is properly managed, it forms an extremely ſtrong cement, which will even ſuſpend a projecting body of conſiderable weight, after it is thoroughly dry and ſet: and is therefore of great uſe to all carvers in ſtone, or others who may have occaſion to join together the parts of bodies of this nature.

Of cements for rock-work, reſervoirs, and other ſuch purpoſes.] A variety of compoſitions are uſed as cements for purpoſes of this kind; in the application of which, regard ſhould be had to the ſituation where they are employed with reſpect to moiſture, and dryneſs; as well as to the magnitude of the bodies to be conjoined together, or the vacuities or fiſſures that are to be made good. Where a great quantity of cement is wanted for coarſer uſes, the coal-aſh mortar (or Welſh tarras as it is called) is the cheapeſt and beſt; and will hold extremely well, not only where it is conſtantly kept wet or dry; but even where it is ſometimes dry and at others wet. But where it is liable to be expoſed to wet and froſt, this cement ſhould, at its being laid on, be ſuffered to dry thoroughly before any moiſture have acceſs to it; and, in that caſe, it will likewiſe be a great improvement to temper it with the blood of any beaſt. This mortar or Welſh tarras muſt be formed of one part lime and two parts of well-ſifted coal-aſhes; and they muſt be thoroughly mixt by being beaten together: for, on the perfect commixture of the ingredients, the goodneſs of the compoſition depends. Where the cement is to remain continually under water, the true tarras is commonly uſed; and will very well anſwer the purpoſe. It may be formed of two parts of lime, and one part of plaiſter of Paris: which ſhould be thoroughly well beaten together; and then uſed immediately. For the fixing ſhells, and other ſuch nice purpoſes, putty is moſt generally uſed. It may be formed for this purpoſe of quicklime, and drying oil, mixed with an equal quantity of linſeed oil; or, where the drying quicker is not neceſſary, it may be made with lime and crude linſeed oil, without the drying oil. The ſtone cement, prepared as above of the bees wax and reſin, is alſo an extremely good compoſition for this purpoſe. But reſin, pitch, and brick-duſt, in equal parts, melted together and uſed hot, are much the cheapeſt cement for ſhell-work; and will perform that office very well, provided the bodies they are to conjoin be perfectly dry when they are uſed.

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